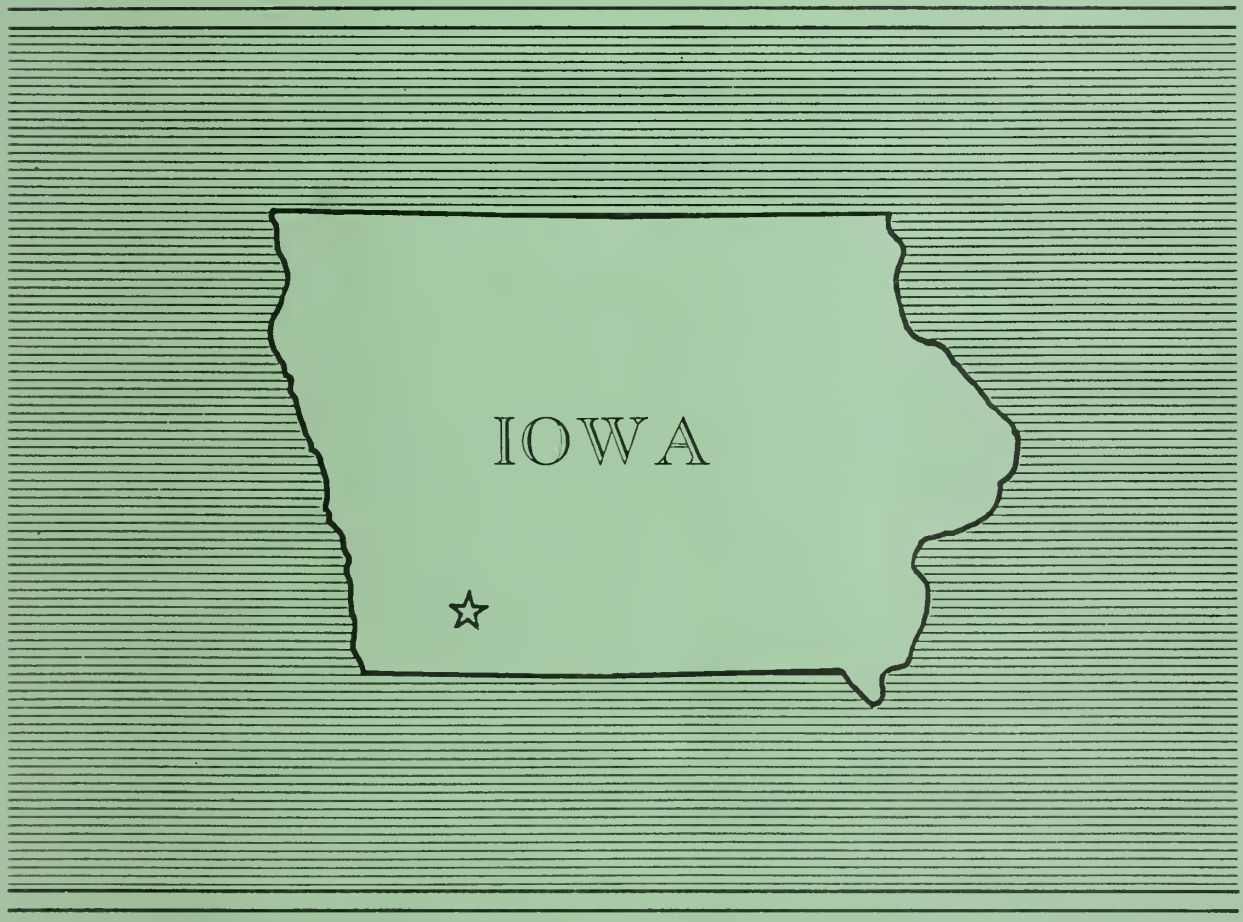
Mr Rothberg

RK PLAN

R WATERSHED PROTECTION, FLOOD PREVENTION, MUNICIPAL WATER SUPPLY, AND RECREATION DEVELOPMENT

WALTER'S CREEK WATERSHED

Adams County, Iowa



OUR SOIL ★ OUR STRENGTH

WATERSHED WORK PLAN

WALTER'S CREEK WATERSHED
Adams County, Iowa

(31,560 ac. or 49.3 sq. mi.)

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666) as amended.

Prepared by: Adams County Soil Conservation District
Adams County Board of Supervisors
Adams County Conservation Board
City of Corning
Corning Board of Water Works Trustees

With Assistance by

U. S. Department of Agriculture, Soil Conservation Service
U. S. Department of Agriculture, Forest Service

July 1964

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WATERSHED WORK PLAN AGREEMENT

between the

ADAMS COUNTY SOIL CONSERVATION DISTRICT
ADAMS COUNTY BOARD OF SUPERVISORS
ADAMS COUNTY CONSERVATION BOARD
CITY OF CORNING
CORNING BOARD OF WATER WORKS TRUSTEES
in the State of Iowa
(hereinafter referred to as the Sponsoring Local Organizations)

and the

SOIL CONSERVATION SERVICE
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organizations for assistance in preparing a plan for works of improvement for the Walter's Creek Watershed, State of Iowa, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666) as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organizations and the Service a mutually satisfactory plan for works of improvement for the Walter's Creek Watershed, State of Iowa, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organizations and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about eight years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Sponsoring Local Organizations will acquire such land, easements, or rights-of-way as will be needed in connection

with the works of improvement. The percentages of this cost to be borne by the Sponsoring Local Organizations and the Service are as follows:

Works of Improvement	Sponsoring Local Organizations (Percent)	Service (Percent)	Estimated Land Rights Cost (Dollars)
2 FWR structures and 37 Gr.Stab.structures	100.0	0	17,390
Multiple purpose Structure M-1-A			
Payment to landowners for 1,610 ac. of land and replacment of an existing road culvert	51.56	48.44	260,000
Legal Fees, land survey costs, and other	100.0	0	4,800

2. The Sponsoring Local Organizations will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of works of improvement.

3. The percentages of construction costs of the structural works of improvement and the basic facilities for recreation to be paid by the Sponsoring Local Organizations and by the Service are as follows:

Works of Improvement	Sponsoring Local Organizations (Percent)	Service (Percent)	Estimated Construction Cost (Dollars)
2 FWR structures	0	100.0	39,200
37 Gr stab.structures	0	100.0	404,860
1 Multi-purpose struc.	20.4	79.6	211,680
1 Drawdown pipe & gate	50.0	50.0	11,200
Basic Facilities for Recreation	50.0	50.0	191,800

4. The percentages of the cost for installation services to be borne by the Sponsoring Local Organizations and the Service are as follows:

Works of Improvement	Sponsoring Local Organizations (Percent)	Service (Percent)	Estimated Installation Service Cost (Dollars)
2 FWR structures and 37 Cr.stab. structures	0	100.0	124,890
1 Multi-purpose structure	6.7	93.3	59,540
1 Drawdown pipe & gate	0	100.0	3,150
Basic Facilities for Recreation	50.0	50.0	42,680

5. The Sponsoring Local Organizations will bear the costs of administering contracts. (Estimated cost $8,080.)

6. The Sponsoring Local Organizations will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure that they will carry out conservation farm or ranch plans on their land.

7. The Sponsoring Local Organizations will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

8. The Sponsoring Local Organizations will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

9. The Sponsoring Local Organizations will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

10. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

11. This agreement does not constitute a financial document to serve as a basis for the obligation of Federal funds, and financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the appropriation of funds for this purpose.

    Where there is a Federal contribution to a construction cost of works of improvement, a separate agreement in connection with each construction contract will be entered into between the Service and the Sponsoring Local Organizations prior to the issuance of the invitation to bid. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

12. The watershed work plan may be amended or revised, and this agreement may be modified or terminated, only by mutual agreement of the parties hereto.

13. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

ADAMS COUNTY SOIL CONSERVATION DISTRICT
Local Organization

By_____

Title_____

Date_____

The signing of this agreement was authorized by a resolution of the governing body of the Adams County Soil Conservation District adopted at a meeting held on _____ 19____.

_____
(Secretary, Local Organization)

Date_____

ADAMS COUNTY BOARD OF SUPERVISORS
Local Organization

By_____

Title_____

Date_____

The signing of this agreement was authorized by a resolution of the Adams County Board of Supervisors, governing body of Adams County, adopted at a meeting held on _____19___.

_____
County Auditor

Date_____

ADAMS COUNTY CONSERVATION BOARD
Local Organization

By_____

Title_____

Date_____

The signing of this agreement was authorized by a resolution of the Adams County Conservation Board adopted at a meeting held on _____19____.

_____
Secretary

Date_____

CITY OF CORNING

By_____

Title_____

Date_____

The signing of this agreement was authorized by a resolution of the City Council, governing body of the City of Corning, adopted at a meeting held on _____19____.

_____
City Clerk

Date_____

CORNING BOARD OF WATER WORKS TRUSTEES

By_____

Title_____

Date_____

The signing of this agreement was authorized by a resolution of the Corning Board of Water Works Trustees adopted at a meeting held on _____19____.

_____
Secretary

Date_____

SOIL CONSERVATION SERVICE
United States Department of Agriculture

By_____
Administrator

Date_____

WATERSHED WORK PLAN

WALTER'S CREEK WATERSHED
Adams County, Iowa

July 1964

SUMMARY OF PLAN

Sponsoring Organizations

The Watershed Work Plan for Walter's Creek Watershed, Adams County, Iowa was prepared by the Adams County Soil Conservation District, hereinafter referred to as the District; the Adams County Board of Supervisors, hereinafter referred to as the County; the Adams County Conservation Board, hereinafter referred to as the Conservation Board; the Corning City Council, hereinafter referred to as the City Council; and the Corning Board of Water Works Trustees, hereinafter referred to as the Water Board; as joint local sponsoring organizations. Technical assistance was provided by the United States Department of Agriculture, Soil Conservation Service, hereinafter referred to as the Service. The U. S. Forest Service assisted in developing the land treatment phase of the work plan.

Description of the Watershed

Walter's Creek Watershed, located in southwest Iowa about two miles north of Corning, contains 31,560 acres or 49.3 square miles. The watershed is long and narrow being about 18 miles in length and 4 miles across at its widest point. Walter's Creek is a right bank tributary of the East Nodaway River and flows in a southwesterly direction.

The land use in the watershed is cropland 65 percent; pasture 27 percent; woodland and wildlife 4 percent; and other uses (roads, farmsteads, idle, etc.) 4 percent.

Watershed Problems

The major problems in the watershed are gully erosion and floodwater damage to agricultural land and crops. Land in upland areas is being destroyed and adjacent areas are being depreciated from cropland to pasture use or idle due to the dissection of fields by gullies and thus making portions inaccessible. The average annual rate of voiding is 20.8 acres and of depreciation is 29.5 acres.

Floodwater damage to crops and pasture is a problem on the bottomlands along Walter's Creek. Inadequate channel capacity causes frequent flooding of these areas. The average annual area flooded is 165 acres. A 50-year frequency flood inundates about 957 acres of agricultural land.

The city of Corning, located two miles south of the watershed, has, in recent years, experienced a shortage of domestic and industrial water during periods of drouth. In 1955 and 1956, severe drouths caused serious concern among the townspeople of Corning when the existing reservoirs were nearly depleted. Expansion of existing industries and establishment of new business ventures is almost impossible with the present unreliable supply of water.

Local interests are concerned with the lack of adequate water-based recreational opportunities in this locale. Boating, fishing, swimming, picnicking, camping, etc. are some of the recreational activities that will be available after the project is installed. The availability of these facilities will help to attract new industries and residents to the area. Local sportsmen and civic groups are very interested in developing a water-based public recreational area in the watershed as part of a multiple-purpose development.

Works of Improvement

The project for the protection and development of the watershed will be installed during an eight-year project installation period at a total cost of $1,716,450. The Public Law 566 share of the cost is $1,074,920 and the other share is $641,530 (Table 1).

Land treatment measures for erosion control will be installed on most of the cropland areas where sheet erosion is a problem. These land treatment measures consist of terraces, contouring, grassed waterways, diversions, grade stabilization structures, farm ponds, woodland improvement, pasture improvement, tile drains, and conservation cropping systems. The installation cost of these measures is estimated to be $337,180 of which $30,000 is for accelerated technical assistance to be provided from P.L. 566 funds. The remaining $307,180 will be borne by the landowners, State funds, and Federal funds provided under authorities other than P.L. 566. Land treatment measures will be maintained by the landowners and/or operators of the farms on which these measures are to be installed, in accordance with cooperative agreements entered into with the District.

Two floodwater retarding structures, one multiple-purpose structure for flood prevention, municipal water, and public recreation, 37 grade stabilization structures, and basic facilities for recreation will be installed during the eight-year project installation period. The estimated installation cost of these structural measures and the public recreation facilities is $1,379,270. Of this amount, P.L. 566 funds will bear $1,044,920. Other or local funds will bear $334,350.

The public recreational development will contain beach facilities, boat ramps and docks, picnic areas, camping areas, bath house, parking areas, rest rooms and pit-type toilets, water systems, connecting interior roads and foot and riding trails. The estimated cost of the basic recreation facilities is $191,300.

The structural measures, except structure M-1-A, will be operated and maintained by the District and the County using tax revenues available from a county-wide tax on agricultural land. Structure M-1-A will be jointly maintained by the District, the County, the Water Board, and the Conservation Board. The public recreational areas and basic facilities are located adjacent to the water impounded by structure M-1-A and will be maintained by the Conservation Board. The estimated total average annual operation and maintenance cost of the structural measures is $1,710 and the estimated annual operation and maintenance cost of the recreational area and facilities is $12,470, giving a total operation and maintenance cost of $14,180 (Table 4).

Project Benefits

The benefits of the project have important effects on the inhabitants and agricultural land in the watershed. Of the 215 farms in the watershed, benefits from gully erosion will accrue to 108 farms. Floodwater damage reduction benefits to crops and pasture will accrue to 20 farms; these latter farms will also realize land enhancement benefits.

The average annual primary and secondary benefits accruing to the structural measures are as follows:

Gully erosion damage reduction	$ 32,610
Floodwater damage reduction	1,650
Changed land use	5,430
More intensive use of land	3,260
Reduced future bridge costs	60
Indirect damage reduction	3,420
Public recreation benefits	135,000
Municipal water benefits	8,310
Secondary benefits	19,050
Total	$208,790

The average annual costs of the structural measures and recreational development are $85,940; the benefits of the project are $208,790; and the benefit-cost ratio is 2.43 to 1.0 (Table 6).

The detention type structures in the project will control the discharge from about 60 percent of the watershed area. No benefits downstream of the watershed have been evaluated but because of the relative size of the controlled area, benefits will probably accrue in the East Nodaway floodplain.

General

There are 215 farms located entirely or partially within the watershed. To date, owners of 158 farms, 22,633 acres, or 72 percent of the watershed, are cooperating with the District in installing land treatment measures. Basic farm plans have been developed on 88 farms, 13,182 acres, or 43 percent of the watershed.

DESCRIPTION OF WATERSHED

Physical Data

Soils: The soils in the watershed are directly or indirectly related to Wisconsin loessial deposits (windblown) on top of the Kansan Glacial Drift. The principal loess soils in the upland area are Sharpsburg, Macksburg, and Ladoga.

The Sharpsburg soil is slightly acid, dark colored, medium to moderately fine textured, well drained, moderately to moderately slow in permeability, with a brownish-gray subsoil. This is a very productive soil when good management practices are followed. The use of soil and water conservation practices to prevent decline of yields by erosion and removal of nutrients is important.

The Macksburg soil is found mostly on level to nearly level divide summits and is dark colored on the surface. It is moderately fine textured, moderate to moderately slow in permeability, and has a very dark gray subsoil. This is an excellent soil for production of farm crops.

The Ladoga soil is very dark gray to black in color, moderately fine textured, well to moderately well drained, moderately to moderately slow in permeability, with a very dark grayish brown subsoil. This a highly productive soil when good management practices are followed. It is important to use soil and water conservation practices to prevent erosion and the decline of yields by removal of nutrients.

The bottomland soils which lie along the drainageways in the upland areas are of the dark colored alluvial-colluvial complex group. These soils are predominantly alluvial materials and are similar to, although somewhat heavier in texture than, the adjacent loess soils. They are the better producing soils of the area. These soils are often in need of artificial drainage, are sometimes subject to overflow, and are subject to severe gullying.

The bottomland which lies in the Walter's Creek floodplain is composed of Nodaway, Colo, and Wabash soils.

The Nodaway series consists of moderately well drained to imperfectly drained soils that have been formed on first bottoms from light colored silty alluvium. These soils are moderately permeable and medium textured and are likely to be flooded in periods of high rainfall. They are suitable for intensive row cropping.

The Colo series are alluvial, dominantly black, but grade to very dark gray color. They are moderately fine textured, moderate to moderately slow in permeability, and poorly drained. Areas that are tile drained and protected from flooding are among the most productive in the watershed.

The Wabash series are dark colored soils developed from alluvial materials. These soils are fine textured, very slowly permeable and poorly drained to very poorly drained. Excess water usually delays field operations in spring and in fall. The excess water can be reduced by a system of open ditches and shallow surface drains. Tile drains are usually not satisfactory because the subsoil is very slowly permeable.

Topography: The topography of the watershed is classed as mature and is characterized by irregular ridges gently sloping on top, with rolling to steep hillside slopes toward the narrow valleys. The major portion of the watershed has slopes from 4 to 20 percent.

The natural drainage system is dendritic (branch-tree-like) and flows southwesterly into the East Nodaway River. There are 2,620 acres of bottomland along Walter's Creek and its tributaries in the watershed.

Land Use and Cover Conditions: The land in the watershed is used predominantly for production of farm crops of corn, soybeans, grain, hay, and pasture. About 65 percent, or 20,607 acres, is used for cropland and 27 percent, or 8,372 acres, for pasture. Woodland and wildlife accounts for about four percent or 1,251 acres, and farmsteads and roads for four percent, or 1,330 acres.

Conservation cropping systems and practices protect much of the cropland. Rotations being used in the uplands are corn-corn-oats-meadow and corn-corn-oats-two years meadow. Intensive row crop rotations are used on the bottomlands. Due to intensive renovation, a portion of the pasture has excellent cover. A small amount of pasture is at times over-grazed and consequently has only fair cover.

Climate: The climate of the watershed is of the extreme midcontinental type. The spring season may fluctuate from extremely wet to fairly dry. Hot winds and periods of prolonged high temperatures are characteristic in the summer season. Precipitation in this area averages about 31 inches annually. Snowfall averages about 23 inches annually. The average frost-free growing season is about 161 days. Extreme temperatures range from -25 degrees to +115 degrees.

Economic Data

According to the United States Census of Population for 1960, Adams County has a population of 7,468.

There are 215 farms located entirely or partially within the watershed. Approximately 77 percent of the farms are owner-operated. The average size of the farms in the watershed is 165 acres and in the county 194 acres. The average value of farms in the county, including land and buildings, is about $34,263 and the average per acre value is $150.

The city of Corning, population 2,041, located about two miles south of the watershed, serves as a marketing and distribution center for the immediate agricultural area. The watershed has adequate transportation facilities with easy access to U. S. Highway 34, State Highway 148, and a line of the Chicago, Burlington, and Quincy Railroad.

The Adams County Soil Conservation District was organized May 4, 1943. To date, owners of 158 farms, 22,633 acres, or 72 percent of the watershed, are cooperating with the District in installing land treatment measures. Basic farm plans have been developed on 88 farms, 13,182 acres, or 42 percent of the watershed.

WATERSHED PROBLEMS

Floodwater Damage

Floodwater damage to crops and pasture is a severe problem along Walter's Creek. Highly productive or potentially productive land is subject to flooding. A 50-year frequency flood is estimated to inundate 957 acres. Average annual flooding occurs on 165 acres. About 253 acres are damaged from floods occurring once in every five years.

The bottomlands are not farmed as extensively or intensively as would be possible with reduced flooding. Many farmers cannot plant their crops in a timely manner. They are reluctant to apply the optimum amounts of fertilizers and will not risk converting pasture and idle areas to cropland because of the frequency and extent of flooding.

Erosion Damage

Gully Erosion: Gully erosion damage to land is the major problem in the watershed. It occurs as land voiding and associated depreciation of the productive capacity of other

areas in a farm unit, especially those areas adjacent to the voided gully areas. The laterals, which advance from the main gully, establish a pattern which makes it necessary to abandon field cropping on most of the areas in between, permitting the use of the land only as pasture or idle areas. These areas cannot be profitably farmed in corn and grain crops because of their relatively small size, the high cost of maintaining crossings, or the cost of extra travel involved. The gullies range in width from 15 to 150 feet and in depth from 4 to 20 feet. If gully erosion continues at its present rate, much valuable cropland will be destroyed and the general economy of the local community will deteriorate.

Gully erosion damage occurs in areas of the watershed where structural measures are not planned; however, the annual value of such damage was found to be low and structural measures were not feasible.

Sheet erosion: Excessive sheet erosion has occurred on many of the rolling cropland areas of the watershed where land treatment measures have not been installed. Continuation of this rate of erosion on these areas will cause a gradual decline in theproductivity of the land by further removal of the more fertile topsoil. The present rate of sheet erosion, averaged over the entire upland areas, is estimated to be 6.0 tons per acre per year.

Indirect Damages

Field studies indicated that indirect damages occur in the watershed and consist of increased cost of normal farm operations, rerouting of traffic, farm equipment breakage, etc. and amount to about 10 percent of the direct damages.

Problems Relating to Water Management

The city of Corning and many civic groups have indicated great interest in incorporating municipal water supply in structure M-1-A. In recent years, the City has experienced critical water shortages, especially in 1955 and 1956 when severe drouth periods were experienced. City officials consider the present water supply reservoir inadequate for the expansion of existing industries, for the development of new businesses and industries, and to provide an adequate supply of water for future predicted normal domestic use. The Farmers Cooperative Creamery is expanding its operations and plans a further expansion in future years. This is a

high water-use industry and the extent of any contemplated expansion will be dependent upon the availability of an adequate and dependable source of water. The City is also seeking to attract new industry to locate in their community and a dependable future water supply is essential.

No interest has been shown in developing water storage for irrigation purposes. Water supplies for farm needs are supplied by wells and farm ponds.

The local sponsoring organizations and local civic groups are concerned with the lack of adequate water-based recreational opportunities in the immediate area. Four parks with limited water-based recreational opportunities lie in a 25 to 50 mile radius of the area. One is a county operated park and three are State owned. The average yearly attendance for the three State parks, Viking, Green Valley, and Three Fires, for the years 1959-1963 inclusive, was 404,241. Outboard motors exceeding six horsepower are not permitted on those State-owned artificial lakes. Local people are very interested in water skiing and speed boating as a possible development along with other recreational facilities in the watershed.

Some 74,947 people reside in six counties in the primary zone of influence and 28,933 in two counties in the secondary zone for a total of 103,880. Greater Des Moines, population 232,219, and Council Bluffs, population 55,641, are 75 and 67 road miles respectively from the center of the watershed.

PROJECTS OF OTHER AGENCIES

No other Federal, State, or local agency has an existing or proposed program for water resource development which will affect or be affected by the works of improvement included in this work plan.

BASIS FOR PROJECT FORMULATION

The agreed upon project objectives, which will maintain or accelerate the social and economic level of activity of the watershed and community, include:

1. Maintenance of soil productivity by the prevention of excessive sheet erosion and removal of soil nutrients;

2. Reduction of the growth of gullies and the accompanying damages;

3. Reduction of floodwater damage to crops and pasture; the level of protection to be once in five years.

4. Providing municipal and industrial water supply not only for critical drouth periods but also for present and future industrial expansion, attracting new industries, and future predicted normal domestic use.

5. Providing water-based public recreational opportunities for residents of the local and surrounding communities.

The protection of watershed lands to permit future sustained production is considered necessary; installation of land treatment measures that will reduce soil losses in such amounts as to enhance future crop yields are considered essential. They will also reduce sediment production, thereby safeguarding the design life of the structural measures.

The control of active gullies that destroy land and will affect only individual farms and which can be installed under going agricultural programs, are considered as land treatment measures to be installed by local people with technical help provided as needed, and with cost sharing assistance from going agricultural programs. Control measures that affect several farms and require group action for their installation, are considered as possible project measures for flood prevention which, if found feasible, will be installed with assistance available under authority of P.L. 566.

Floodwater damage reduction to crops and pasture along Walter's Creek can be accomplished with floodwater retarding structures. This would be preferred to a channel improvement of the stream.

Grade stabilization and floodwater retarding structural measures are to be selected from alternate combinations or choices that are available. The type of structure selected is to be governed by the type most economical to install considering the size of drainage area, the required amount of head control or drop through the structure, the topography at the site, the length of dam, and ease of obtaining temporary storage, etc.

The local sponsoring organizations have banded together to provide financial assistance to incorporate municipal

water and a public recreational development in the watershed. These sponsors have also retained the services of a private engineering firm to provide technical assistance in formulating a recreation plan, which has been made a part of this work plan.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

The project provides for a sound and effective land treatment program to be installed on most of the agricultural land needing treatment during the eight-year project installation period. Alternative methods of treatment may be used. Those to be applied will be based on the decisions of the landowner after adequate consideration has been given to those that are available. For example, to control sheet erosion losses to permissible limits, an intensive cropping rotation with only moderate amounts of meadow may be used on Class IIIe lands that are terraced and contour farmed. Where contouring alone is used, the rotations must include a higher proportion of meadow and less of the grain and intertilled crops, or the land may be used for permanent pasture.

Similar alternatives are available on other land classes. The level terraces have a further advantage, however, of reducing runoff and thus decreasing the amounts of needed treatments in downstream gullies. Other treatments, such as grassed waterways and gully stabilizing structures, will be needed in varying amounts depending somewhat upon other treatments selected.

Past experience in the watershed area has been used as a guide in arriving at estimates of the combinations of land treatment measures that will be applied on the various farms. The following estimates may, therefore, be finally modified to the extent that other alternative treatments are selected and applied.

Open-end level and gradient terraces, to reduce runoff and sheet and gully erosion, are planned for installation where soils and topography are suitable and where determined practical by the workunit conservationist and the farmer. It is planned that 12 miles of level terraces and 246 miles of gradient terraces will be installed. About 9 miles of level and 173 miles of gradient terraces have already been constructed in the watershed.

On sloping land not requiring or not suited to terraces as well as on the terraced land, contour farming is used to reduce sheet erosion. About 60 percent, or 11,960 acres, of the present cropland is being contour farmed. It is planned that 4,760 additional acres will be contoured.

Land treatment grassed waterways are natural watercourses shaped and seeded to grasses to safely convey runoff water from the fields and prevent erosion. Tile drains in the waterways are often needed to establish and properly maintain the vegetation and to permit crossing the waterway during field operations. Currently 357 acres of such waterways have been established and 130 acres more are planned to be constructed during the eight-year project installation period. Feasibility of many of these waterways is dependent on installation of the stabilization structures planned in the watershed.

Diversions are planned at the junction of many bottomland and upland areas to divert hill runoff and thus protect the productive bottomland from excess water. About five miles of such diversions are planned to be constructed. Five miles have been installed to date.

Land treatment grade stabilization structures are those structures that are installed by the individual farmers. Their main purpose is to stabilize waterways and gullies on individual farms. These are generally the smaller drop inlet type structure. Farm ponds, used primarily for livestock water supply, will also be installed. About 8 grade stabilization structures and 24 farm ponds are planned for construction. About 9 grade stabilizing structures and 43 ponds have been installed to date.

Installation of tile drains in waterways and in bottomland areas along with a minor amount of surface field ditches are planned in many localized areas. These measures will permit changed land use on some bottomland areas from pasture to cropland. About 20 miles of tile drains have been installed to date and 40 miles are planned to be installed. About one mile of surface field ditch is also planned.

A program of pasture improvement is underway in the watershed. Old blue grass pastures are being renovated by fertilizing and seeding to higher producing legume-grass mixtures. About 250 acres of pasture have already been improved and 1,200 acres are planned for renovation during the eight-year project installation period.

The U. S. Forest Service, cooperating with the State Forester, found that improved woodland management practices will bring about greater values for watershed protection, wildlife, recreation, and wood production. These benefits can be realized if the following measures are applied: Livestock exclusion, improved forestry practices, cultural practices, and forestation.

Livestock exclusion consists of excluding all farm livestock permanently from woodlands and is planned on 75 acres of woodland. Improved forestry practices, accomplished through proper management of woodlands, establishes a permanent forest cover adequately stocked with desirable species of suitable age classes. This is planned for 150 acres.

Cultural practices consist of the conventional timber stand improvement measures and reinforcement planting with special emphasis on improving the hydrologic condition of the woodlands. This practice is planned for 12 acres. Forestation consists of planting suitable species of trees on open land for the establishment of a forest stand. These plantings are recommended for land better suited to woodland than to agriculture and is planned on 40 acres.

The estimated cost of installing the planned land treatment measures is $337,180. This includes costs to farmers, cost sharing from going agricultural programs, and technical assistance from State, P.L. 46, and P.L. 566 funds (Table 1).

Structural Measures

The structural measures included in this project are required to stabilize the major watercourses which affect two or more farms, to reduce floodwater damage to crops and pasture, to provide municipal water for the city of Corning, and to provide a recreational development.

Of the 40 structures to be installed, one is a multiple-purpose flood prevention, municipal water, and public recreation structure; two are drop inlet floodwater retarding structures; and 37 are grade stabilization structures. Of the latter, 30 are drop inlet detention type structures; three are drop spillways; and four are box inlets on existing road culvert.

A study was made of various sites for a possible multiple-purpose structure. Structure site M-1-A was selected as meeting the needs for flood prevention, municipal water supply, and public recreation. It will have a normal water

pool with a surrounding area that will lend itself well to the development of recreational areas. Some of these areas have wooded scenic slopes for picnic and camp sites. The normal pool will have long bays for selective use of fishing, boating, water skiing, swimming, hunting, etc.

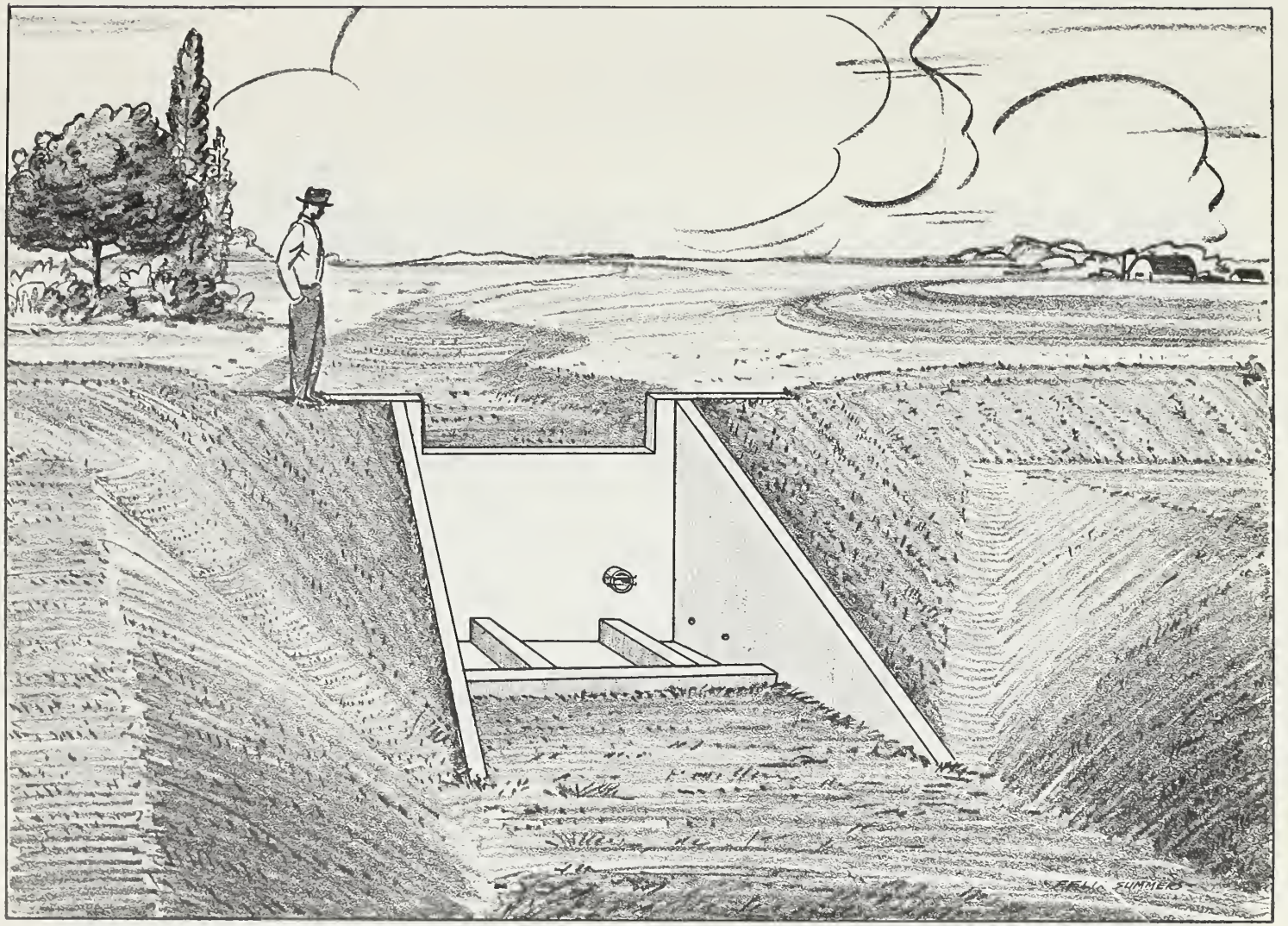
Drop Inlet Structure, Detention Type: This type of structure consists of a compacted earthfill dam and a principal spillway of pre-cast reinforced concrete pipe or corrugated metal pipe with suitable outlet. In some cases a hooded inlet is used in place of a vertical drop inlet. The principal spillways are designed to safely convey a 50-year frequency flood. An open vegetative emergency spillway channel will be provided at one or both ends of the dam to convey the runoff from storms of greater magnitude without causing over-topping of the dam. This type of structure is illustrated in sketches SS-2A, SS-8, and SS-12.

Box Inlet to Culvert: This is a concrete box inlet riser on an existing road culvert. It does not reduce the capacity of the culvert for flow of water, but reduces the gradient of the upstream watercourse. A tile outlet for the upstream waterway is generally included in its design. Features of this structure are shown in sketch SS-11.

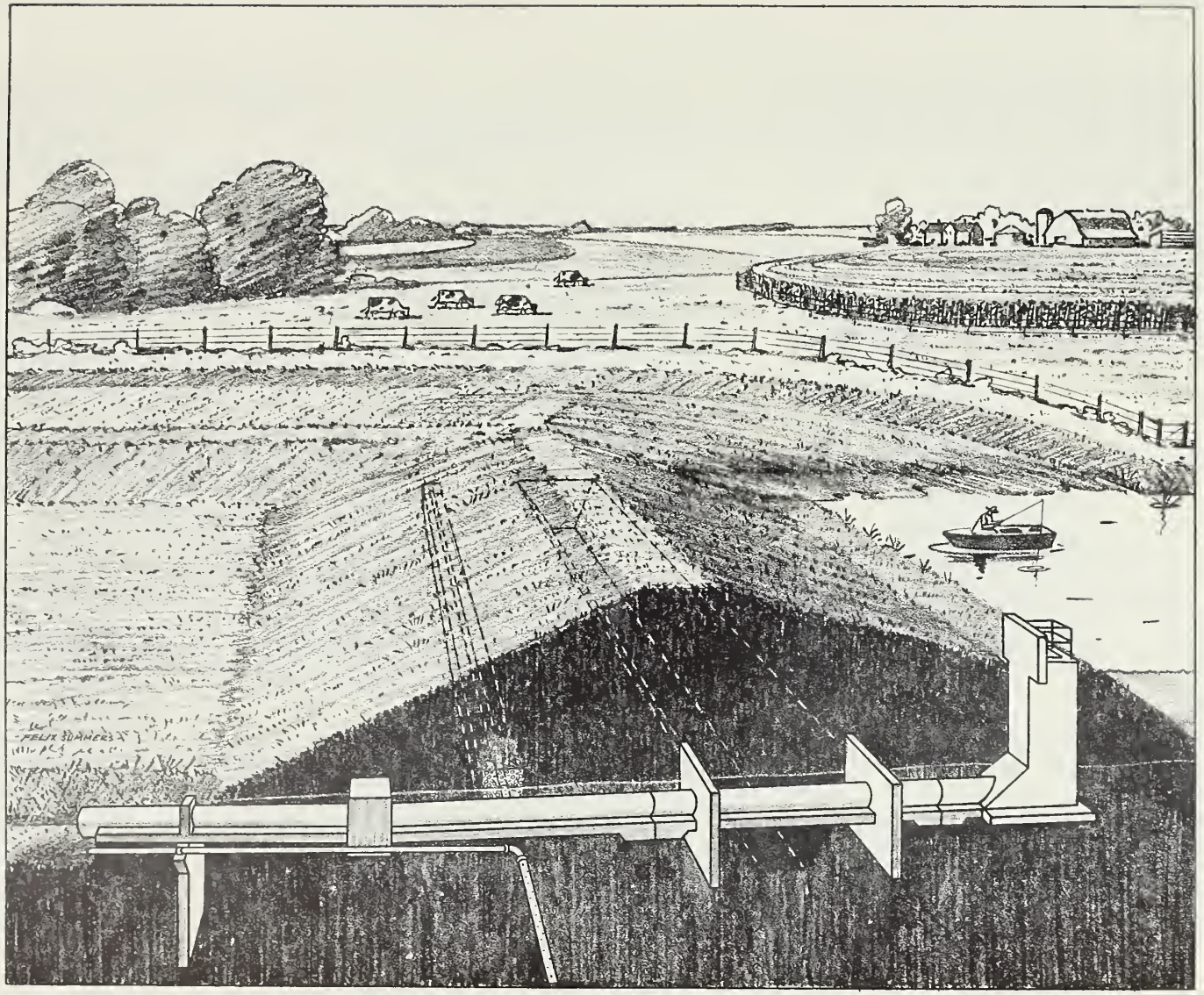
Drop Spillway: This is a concrete structure with a weir notch located in a watercourse to drop the water from one level to another for gradient control and the stabilization of the watercourse. It does not have floodwater retarding features. It is generally utilized for a tile outlet. It is illustrated in sketch SS-1.

Approximate locations of the various types of structures are shown in Figure 4. Tables 2 and 3 set forth further data pertaining to costs, construction quantities, and design features of the various structural measures.

Structure M-1-A is a multiple-purpose flood prevention, municipal water, and public recreational development structure. It is similar to that shown in sketch SS-8. A drawdown pipe and gate, 48-inch, will be provided and attached to the upstream side of the drop inlet. The gate will be manually operated periodically as required, to draw down the water level for the recreational purpose in control of aquatic growth, reproduction of fish, and for removal of undesirable fish. The detention pool, dam and spillway will occupy 1,000 acres of land. The surface area of water available for recreational use is 700 acres but may be drawn down to 650 acres (municipal water). Land provided for basic recreation facilities at the locations adjacent to the water and including sites for picnicking, camping, boat launching, car parking and other facilities is 610 acres.



Drop Spillway



Earth fill dam with concrete drop inlet and conservation pool.

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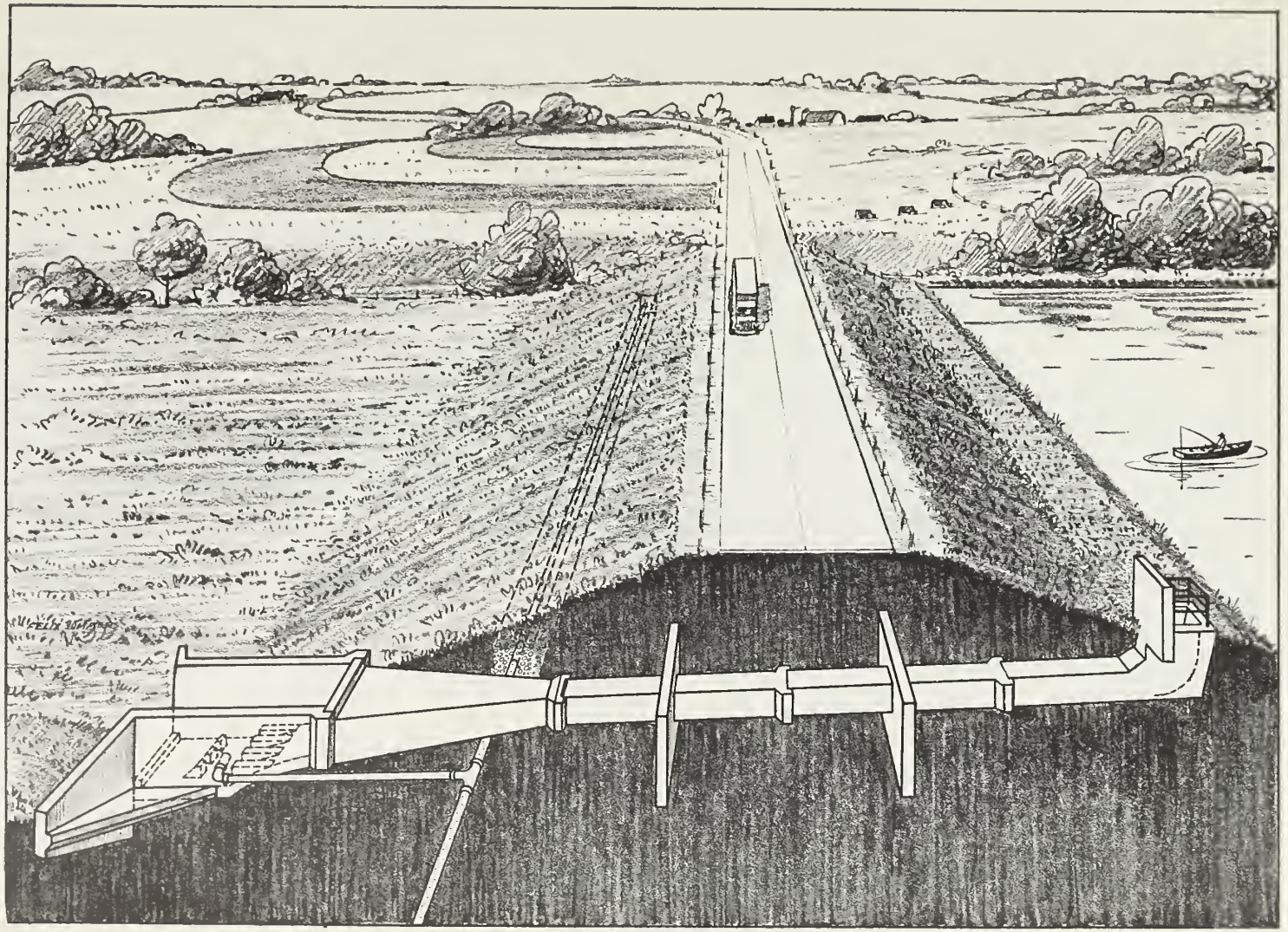
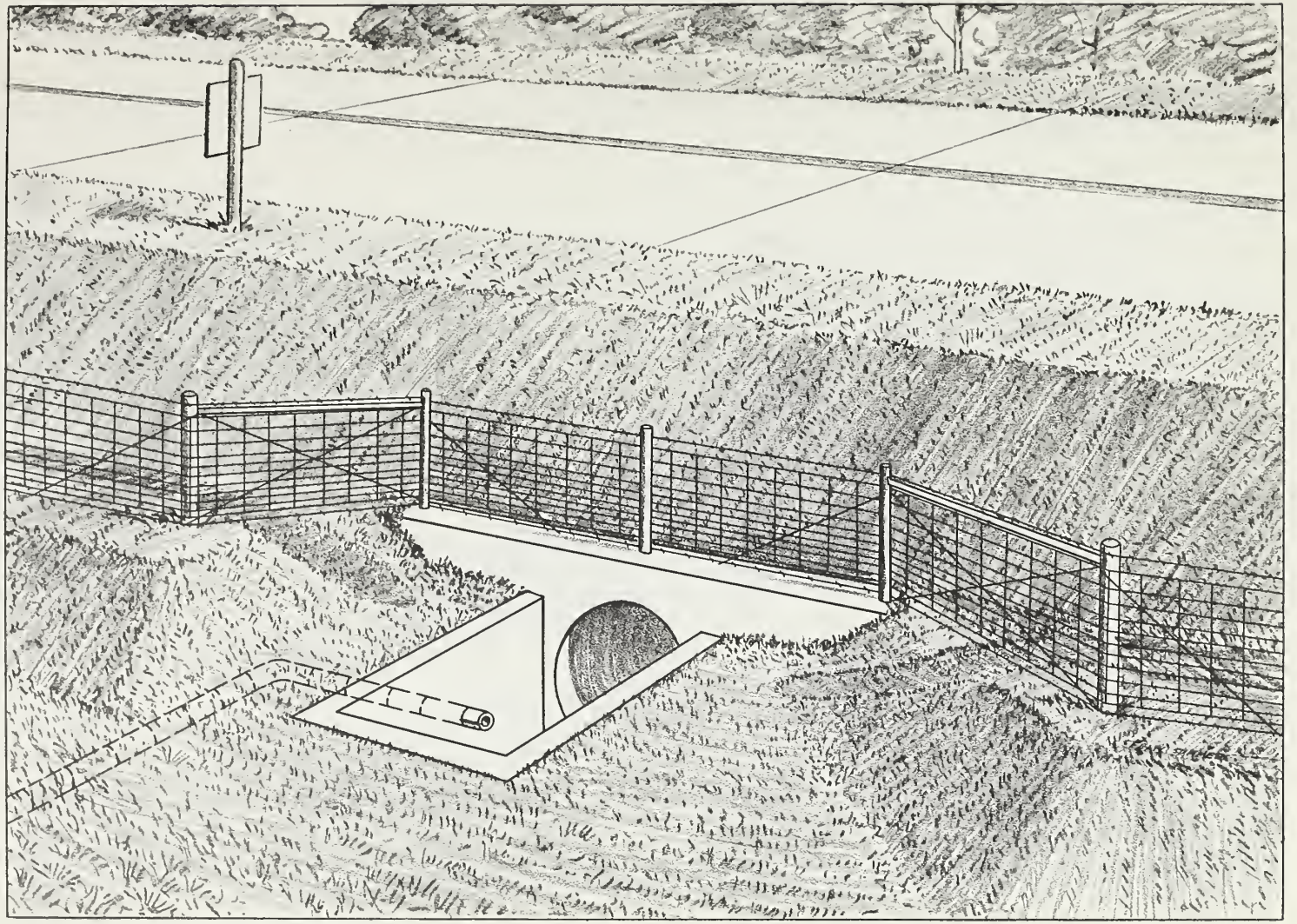
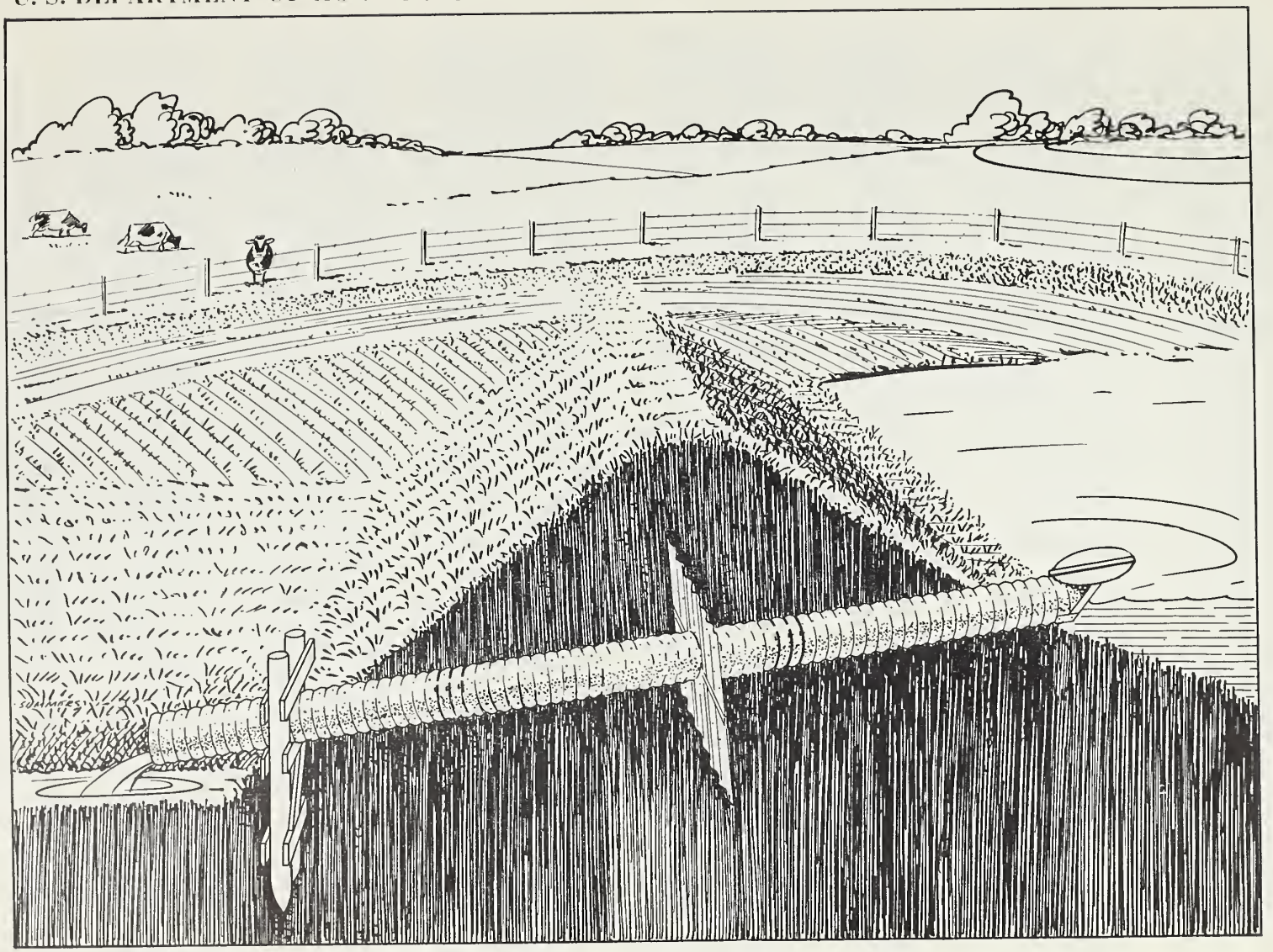


Monolithic drop-inlet on roadway and conservation pool with recreation and wildlife.



Culvert box-inlet.



Metal pipe with hooded inlet.

The public recreation development plan (Figure 3) indicates the general location of the basic facilities. The basic recreation facilities to be installed in these areas have an estimated construction cost of $191,800 and are listed in Table 2B.

The normal water pool of structure M-1-A will flood the outlet of an existing 12'x12' culvert located about a quarter mile east of the northeast corner of Section 2, Township 72 North, Range 34 West. This culvert will be replaced at a higher elevation and is considered as a lands, easements and rights-of way cost (induced damage).

Water for recreation in the amount of 3,920 acre-feet was added to the storage needed for flood prevention (sediment). The water surface area for recreation was likewise thereby increased.

The Water Board staff made studies of previous years water usage as related to changes in population and the existing operating industries. This data was used along with anticipated increases in per capita use, increases in population, and increases in use by industry to forecast the annual future needs.

Consideration was then given to the pro-rata share of estimated evaporation and seepage losses in the proposed impoundment; to the inflow to the impoundment from the watershed during years of lowest stream flow; and to the amount of rainfall on the water surface. The water storage needs were thus estimated to be 961 acre-feet; and are provided for in the plan.

Pumping facilities and a pipe line and intake will be installed about one-half mile upstream from the dam by the Water Board at an estimated cost of $102,280 to transport the water to Corning. The existing water treatment facilities are adequate at the present time.

The installation costs of all structures and the recreation development are $1,379,270 (Table 1). The annual installation costs are $59,140, the annual operation and maintenance costs are $14,180, and the other economic costs are $12,620, for a total average annual cost of $85,940 (Table 4).

EXPLANATION OF INSTALLATION COSTS

The project installation costs, as used in this work plan, include all costs to P.L. 566 and other funds, in cash or its equivalent, for installing all works of improvement for

the project purposes of watershed protection and flood prevention and for non-agricultural water management, which includes both a municipal water supply and a recreational development.

The estimated cost of installing the land treatment measures is $327,180 and includes costs to the farmers, cost sharing from going agricultural programs, and technical assistance from State, P.L.46 and P.L. 566 funds. This is divided into $30,000 from P.L. 566 funds and $307,180 from other funds (Table 1).

Construction costs of the structural measures include all contract costs for the flood prevention and non-agricultural water management purposes. To the engineers' cost estimate of construction was added a contingency cost which provides for unforeseeable cost increases during construction. Based upon experience to date in similar watershed work, the contingency cost was estimated to be 12 percent of the engineers' estimate. The total construction costs are estimated to be $858,740 (Table 1). Of this amount, $714,060 will be provided from P.L. 566 funds and $144,680 from other or local funds.

Installation services include both engineering and other administrative and overhead services for the structural measures and for the recreational development. Engineering services include all costs for the services of engineers and geologists used in designing and installation, and includes the cost of construction surveys and investigations, necessary inspections, installation assistance, preparation and interpretation of plans and specifications, and similar services in carrying out construction of the structures and facilities for the recreational plan. Other installation services include all administrative type overhead costs as well as direct costs for installation services provided by other than engineers and geologists.

The installation services costs for all structural measures and for recreation are estimated to be $230,260. P.L. 566 funds will bear $204,920 and other funds $25,340 (Table 1). The latter amount, $25,340, includes all local engineering and other services costs for municipal water supply and the local sponsors' share associated with the installation of the recreational facilities.

Land easements, and rights-of-way costs include all expenditures made in acquiring land, easements, and rights-of-way or their value as estimated by the local organization with concurrence of the Service. These costs also include the costs of replacing an existing culvert with another culvert

at a higher elevation to permit it to function when the permanent pool of structure M-1-A is full; also, the costs of making land surveys, title search, legal fees, etc. for the recreational development area. Of the total, $282,190 cost for land, easements, and rights-of-way, P.L. 566 funds will bear $125,940 and other funds $156,250 (Table 1).

The cost of administration of contracts includes all local costs for administrative, legal, and clerical services incurred by the contracting local organizations in carrying out contracts. This estimated required non-Federal cost is $8,080 (Table 1).

The Use of Facilities Method was used to allocate the construction costs of structure M-1-A to the multiple purposes. It was determined that 9,450 acre-feet, or 65.9 percent of the total storage is provided for flood prevention; 960 acre-feet, or 6.7 percent of the total storage is provided for municipal water; and 3,920 acre-feet, or 27.4 percent of the storage is provided for public recreation. Therefore, $139,500 of the joint construction costs of M-1-A were allocated to flood prevention, $14,180 were allocated to municipal water, and $58,000 were allocated to recreation.

The local sponsoring organizations will pay for 50 percent of the $58,000 joint construction cost allocated to recreation, or $29,000 and for all of the $14,180 allocated to municipal water or a total of $43,180. The Service will pay for the remaining 50 percent of the joint construction cost allocated to recreation, or $29,000, plus $139,500 of the construction cost allocated to flood prevention, giving a total Service cost of $168,500. The net ratio of these total joint construction costs of M-1-A is as follows: The Service will bear 79.6 percent or $168,500 of the joint construction costs ($211,680) and the local sponsoring organizations will bear 6.7 percent for municipal water and 13.7 percent for recreation or a total local share of 20.4 percent or $43,180.

The drawdown pipe and gate is a specific cost item for recreation. This $11,200 construction cost will be cost shared 50 percent by the Service and 50 percent by the sponsors, or $5,600 by each.

The basic facilities are for public recreation and this $191,800 cost will be shared 50 percent by the Service and 50 percent by the sponsors, or $95,900 by each.

The cost of replacing an existing road culvert at a higher elevation in the recreation area is $20,000. This cost will be shared 48.44 percent by the Service and 51.56 percent by the sponsors or $9,690 and $10,310 respectively.

The costs of land, easements, and rights-of-way for structure M-1-A and the recreation area is $240,000. This land includes fee title (1,590 acres) to the dam site; the emergency spillway area; the permanent recreation and water supply pool; the temporary storage pool for storm runoff into the reservoir; lands within 100 feet of a contour line at the emergency spillway elevation (except that flowage easements are anticipated at three sites in the upstream main and 2 laterals, 20 acres); and additional adjacent lands for recreational use (total 1,610 acres).

The land area required to store the municipal water supply was found to be 50 acres; this is the difference between the top of the recreation pool and the top of the municipal water supply pool. This is 3.1 percent of the 1,610 acres (total lands), or $7,500 of the total $240,000 land rights costs. This will be paid for 100 percent by the local sponsors.

The Service and sponsors will share the remaining costs of lands of $232,500, fifty percent by the Service and fifty percent by the sponsors or $116,250 each. The total of the above, computed on an equivalent basis, gives an overall cost sharing for the lands of 48.44 percent by the Service and 51.56 percent by the sponsors.

The costs of land, surveys, legal fees, etc., estimated to be $4,800, will be borne by the sponsors.

The total installation services costs for structure M-1-A are estimated to be $59,540; 6.7 percent of this amount, or $4,000, was allocated to municipal water supply and will be paid for by the sponsors. The remaining $55,540 will be paid for by the Service. The Service will also provide $3,150 installation services costs for the drawdown pipe and gate.

The $42,680 cost of installation services for construction of the basic recreational facilities will be shared 50-50 by the Service and the sponsors, or $21,340 each.

An estimated schedule of Federal and non-Federal obligations, by fiscal years, for land treatment and structural measures and non-agricultural water management purposes is tabulated below:

Fiscal Year	P.L. 566	Other	Total
1	$ 80,000	$ 50,000	$ 130,000
2	90,000	75,000	165,000
3	90,000	100,000	190,000
4	185,000	100,000	285,000
5	185,000	70,000	255,000
6	250,000	120,000	370,000
7	129,000	100,000	229,000
8	65,920	26,530	92,450
Total	$1,074,920	$641,530	$1,716,450

EFFECTS OF WORKS OF IMPROVEMENT

Land Treatment Measures

The planned terraces and contour farming along with conservation cropping systems will effectively reduce sheet erosion on cropland where these practices are installed. The present rate of 6.0 tons per acre per year averaged for the entire upland area, including cropland, pasture, and other land uses, will be reduced to 4.5 tons per acre per year, a 25 percent reduction in sheet erosion and in that source of sediment to structures planned downstream. The planned waterways will facilitate farming operations by eliminating existing non-crossable gullies. The planned land treatment measures will bring about further conservation benefits in the form of increased farm income. These benefits have been evaluated only in the gully damage areas.

Structural Measures

Floodwater damage to crops and pasture in the evaluated area will be reduced 84 percent. The project will eliminate floods of less than five-year frequency. The area damaged by a 50-year frequency flood will be reduced from 957 acres to 535 acres. The average annual area flooded will be reduced from 165 acres to 31 acres. Reduction of flooding will permit changed land use and more intensive use of land on 253 acres of bottomland.

With the project installed, farmers will convert bottomland pasture and idle areas to cropland and follow a high level of management. Much of this bottomland is the most productive land on those farm units. The use of this bottomland for cropping will permit less intensive cropping on the more erodible upland areas.

The grade stabilization structures, together with structural and land treatment waterways in immediate upstream areas, will prevent future land destruction and depreciation of 4,343 acres of croplands in the watershed.

Project benefits have far-reaching effects on the inhabitants, land, and facilities in the watershed. Of the 215 farms in the watershed, floodwater damage reduction benefits and land enhancement benefits will accrue to 20 farms and benefits from reduction of gully erosion damage will accrue to 108 farms. The County will also realize benefits to road bridges.

The city of Corning, population 2,041, will be assured of an adequate municipal water supply to be incorporated into the plan of multiple-purpose structure M-1-A. This will give the City a dependable supply of water for existing industries and for encouragement of new industries to locate in this community and to permit present businesses to expand. Water for future increased domestic use will also be available.

Recreational activities that will be available to the public are: Fishing, swimming, boating, water skiing, camping, picnicking, hunting, etc. The number of visitor days utilizing these facilities has been estimated to be 90,000 annually.

Secondary benefits will accrue within the immediate zone of influence of the project. They include (1) the transporting, processing, and marketing of goods and services that produce the primary benefits, and (2) the supplying of additional materials and services required to make possible the increased net returns which result from the installation of the project. These benefits accrue primarily to processors and merchants providing services to farmers and were estimated to be about 10 percent of the direct primary benefits.

Farmers have indicated that they will stock many of the water impoundments with bass and bluegill. Incidental recreation benefits from fishing, hunting, and picnicking will be available from many of those sites but they were not evaluated.

PROJECT BENEFITS

The average annual evaluated floodwater damage to crops and pasture of $1,960 will be reduced to $310, a $1,650 floodwater damage reduction benefit (Table 5).

Changed land use benefits that will accrue annually on protected bottomland areas are $5,430. Annual benefits from more intensive use of bottomlands protected from damage are

$3,260 giving a total annual land enhancement benefit of $8,690 (Table 6).

The annual evaluated gully erosion damage to agricultural lands of $34,060 will be eliminated (Table 5).

Indirect damages of $3,450, which accompany the direct damages, will be reduced to $30, giving a $3,420 benefit (Table 5).

Benefits from reduced future bridge costs are estimated to be $60 annually (Table 6).

Municipal water benefits accruing to the city of Corning amount to $8,310 annually (Table 6).

Public recreational development benefits accruing to the project are estimated to have an annual value of $135,000 (Table 6).

The average annual value of local secondary benefits is $19,050 (Table 6).

The total of the average annual primary and secondary benefits resulting from the project are $210,240.

COMPARISON OF BENEFITS AND COSTS

The average annual primary and local secondary flood prevention and non-agricultural water management benefits from the structural measures in the project of $208,790 compared with the average annual cost of $85,940 gives a benefit-cost ratio of 2.43 to 1.0 (Table 6).

The average annual primary flood prevention and non-agricultural water management benefits from the structural measures, excluding local secondary benefits, are $189,740; this compared with the average annual cost of $85,940 gives a benefit-cost ratio of 2.21 to 1.0.

PROJECT INSTALLATION

This project will be installed during an eight-year project installation period. The local sponsoring organizations and the Service will coordinate the installation of the structural measures in the project with the planning and application of land treatment measures on the individual farms. The planning and application of land treatment measures should progress as rapidly as resources permit and should be of such intensity and scope as to meet the

hydrologic and sediment design criteria of the structural measures.

Land Treatment Measures

A sound and effective land treatment program will be planned and installed on a majority of the farms in the watershed. The District governing body will conduct an intensive educational program, together with demonstrations, group planning, and direct assistance to individual farms to facilitate the installation of the planned land treatment measures. In addition the District will also schedule meetings to facilitate carrying out the planned program, set priorities of farmers to be assisted, make periodic checks on completed measures and maintenance needs, and otherwise assist to further the land treatment phase of the watershed project. Details of each individual landowner's portion of the land treatment measures will be defined in the cooperator's basic conservation farm plan.

Land treatment measures will be installed by the individual farmer or small groups of farmers working together. The current Agricultural Conservation Program will be utilized along with such technical assistance as may be available for those practices eligible for cost-sharing assistance. Service technicians working with the District will assist with the planning and application of land treatment measures.

The current land treatment program is being planned and applied by the farmers and District with technical assistance provided by the Service under the authority of P.L. 46. In order that the planned land treatment measures may be installed during the project period, an acceleration of the present rate of application will be required. Additional technical assistance for this purpose will be made available by the Service from P.L. 566 funds.

Technical assistance requested by the landowners for application of the forestry measures will be provided by the Section of Forestry, Iowa Conservation Commission, in cooperation with the U. S. Forest Service under the Cooperative Forest Management Program.

Additional land treatment measures will more completely protect the remaining watershed lands and it is expected that these needed additional measures will be installed by landowners in the years following the project installation period. It is expected that normal going program assistance will be available to farmers for this installation.

Structural Measures

The installation of structural measures will follow a sequence such that upstream works of stabilization and waterflow control will precede the installation of those that lie downstream. In this manner the sediment storage capacity and the temporary retarding pools at downstream sites can be designed and installed at the least cost for the flood prevention purpose. Project costs and evaluations of measures have proceeded on that basis.

The Service will provide the installation services for the structural measures; it is anticipated that for structure M-1-A, the Water Board will request such engineering assistance from the Service and pay the Service for the costs of the allocated installation services for the municipal water purpose. An agreement for such payment by the Water Board to the Service for engineering services relating to the municipal water purpose in structure M-1-A will be executed prior to the development of plans. This lump sum payment by the Water Board to the Service is estimated to be $4,000.

All structural measures will be installed by contract. The Conservation Board will contract for and install structure M-1-A. The District will contract for and install all the remaining structures. The Conservation Board will contract for the installation of the basic recreational facilities.

A Project Agreement will be executed for each contract unit of work prior to the issuance of invitations to bid. This agreement for structure M-1-A will be executed by the Service, the Conservation Board, Water Board, County Board, and City Council; for all other structures it will be executed by the Service, the District, and the County Board.

A Facilities Agreement will be executed by the Service, the District, the Conservation Board, and the City Council for the basic recreational facilities prior to the issuance of invitations to bid.

Thirty-six construction units have been established (Table 7) in order to provide maximum flexibility in establishing a sequence for installing the structural measures. Land, easements, and rights-of-way for all structural measures in any one construction unit will be obtained before a project agreement is executed for the installation of any of the structural measures in that construction unit.

Land Rights Agreements will be executed by the Service, Water Board, Conservation Board, and City Council prior to the purchase of any land for structure M-1-A and the recreation area. This agreement will set forth the responsibilities of each party in obtaining land rights for structure M-1-A and the recreational land.

Land, easements, and rights-of-way for the structural measures, except structure M-1-A, will be obtained from the local landowners by the District, and those needed rights-of-way now held by the County for road use purposes at structure sites 1-1, 27-1 and 34-2 will be furnished by the County. Rights-of-way for installing structure 18-1 will be furnished by the Iowa State Highway Commission.

The following general planning considerations for structure M-1-A and the recreational development have been recognized and considered in the development of the plan.

1. The Adams County Board of Supervisors will close those parts (1), of the N-S road located in Section 10; (2) of the N-S road located in Sections 2 and 11; and (3) of the N-S road on the east edge of Section 1 all in T72N, R34W that will fall within the floodwater pool of structure M-1-A. The remainder of those roads will be operated and maintained in a normal manner.

2. All private land adjacent to the recreation lands will be zoned and regulated by the Zoning Board and County Board. Private development in those areas, as allowed by the Zoning and County Boards will include cabins, summer homes, golf course, and/or similar type developments. However, such private landowners or developments cannot have exclusive use of any section of the public lands or shoreline. All other land adjacent to the recreation lands will be zoned for agricultural uses only.

3. Fences will be installed at other than existing property lines where new boundaries are formed by the "taking lines", except that markers may be used instead between the recreation land and private land zoned for private development as explained above.

4. Public access to the recreation land will be available only at designated public access points, except that access will not be restricted from

the zoned private development land to the adjacent recreation land.

5. The Conservation Board will acquire fee simple title to the lands falling within the "taking lines" as shown on the Recreation Plan Map. These include (a) the dam site, spillway area, and all lands within the maximum flood stage of the reservoir that are significant for public access and use and (b) lands adjacent to the maximum flood stage of the reservoir for recreation uses that will allow rights-of-way for at least a footpath above the maximum flood stage of the reservoir connecting all public use areas on each side of the reservoir, and all the land needed for the basic recreational facilities.

   Perpetual flowage easements will be acquired by the Conservation Board on lands within the maximum flood stage of the reservoir lying upstream and so remote from the normal water pool that they will have no substantial value for public recreation.

6. The interior roads and parking areas are planned to be surfaced with crushed rock or gravel.

7. Regulations governing the use of the lake and park areas will be developed and enforced by the Conservation Board.

8. The water level of the lake can be lowered by the use of a drawdown pipe and gate for the purpose of controlling aquatic growth and enhancing fish or water fowl habitat and for the control of undesirable species of fish.

9. The lease of land for concessions will be permitted for essential purposes such as the sale of lunches, soft drinks, bait, gas, oil, swimming attire, rental of boats, motors, etc. The Conservation Board will provide lifeguard service.

10. The Conservation Board does not plan to charge an admission fee. However, it may be desirable to make such charges at some future time. Such fees may not produce revenues in excess of the Conservation Board's requirement to amortize their initial investment and to provide adequate operation and maintenance. The Conservation Board in

such event will establish a schedule of maximum admission or use fees which may be charged by a private concessionaire(s) where involved. The schedules of admission and user fees together with other requirements for operation and maintenance of the recreational facilities must be mutually agreed to by the Conservation Board and the Service and set forth in the Operation and Maintenance Agreement or amendments thereto.

11. Recreation facilities will be administered, operated, and maintained by the Conservation Board in accordance with the operation and maintenance agreement to be executed by the Conservation Board and the Service.

12. The Conservation Board, in consultation with the Service, will contract with a private engineering firm to plan and supervise the installation of all interior roads, fences, and basic recreation facilities. The Service will reimburse the Conservation Board 50 percent of those costs.

13. The Service will provide all engineering services for and supervise the construction of structure M-1-A and the drawdown pipe and gate. (Water Board will pay a portion of engineering services costs.)

14. The Conservation Commission will agree that all land on which cost sharing with P.L. 566 funds is provided will not be sold or otherwise disposed of without prior approval of the Service, for the evaluated life of the project except to a public agency which will operate and maintain the recreational development for public use.

15. Cost sharing will not be provided for certain ineligible measures such as lunch stands, cabins, motels, community buildings, dance pavilions, boat houses, caretaker's residence, maintenance shop, and similar or related facilities.

16. Prior to providing cost sharing for the basic recreation facilities the Conservation Board and the Service will agree on tentative specifications for the type and quantity of those facilities. If the Conservation Board desires to install a greater number or more elaborate facilities than those which meet Service standards, they may do so at their own expense.

FINANCING PROJECT INSTALLATION

Federal assistance for installing works of improvement, as described in this work plan, will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666, as amended)

Individual farmers will assume the cost of installing land treatment measures with such cost sharing assistance as may be available under the provisions of the Agricultural Conservation Program or any other going agricultural cost sharing program.

The Service will provide, from P.L. 566 funds, sufficient technical assistance to accelerate the installation of the land treatment measures as set forth in this work plan. All other technical assistance will be provided from currently established Federal and State programs.

The Service will finance its share of costs of construction, land rights, and installation services for the project structural measures and recreational development from funds appropriated under authority of P.L. 566.

The Conservation Board will obtain monies for their share of construction, land rights, basic recreational facilities, and operation and maintenance costs from a county-wide levy, not to exceed one mill, imposed by the Adams County Board of Supervisors (Chapter 111A, Code of Iowa, 1958).

The Water Board will finance their share of construction costs, installation services costs, land rights, and operation and maintenance costs incurred as a part of this project by use of utility revenues and/or issuance of revenue bonds.

The County will finance its share of construction costs of replacing a 12'x12' culvert at a higher elevation from county road funds.

All land, easements, and rights-of-way for structural measures, except structure M-1-A and the recreation area, will be donated by concerned landowners, or otherwise acquired by the District with funds that are now available or that are to be donated.

Facilities and funds are available to the local sponsoring organizations responsible for the administration of contracts for structural measures and the recreational development.

The local sponsoring organizations have not made complete arrangements among themselves as to the monetary obligations each of them will assume in cost sharing for construction of M-1-A and the recreational development. Each of them has emphatically stated that the needed monies in total will be available when required. This portion of the overall project proposal is not scheduled for four or five years, since upstream treatments have priority and are important to reduce sediment production to the site. It has been agreed that the Water Board presently commits itself to a minimum of $25,800 (municipal water allocation); the County Board to a minimum of $36,560 (County share of cost of replacing 12'x12' culvert and 3.2 miles access road); and the Conservation Board to a minimum of $72,000 (approximate amount available in four years from one mill levy). The above costs total to be $134,360. The remaining estimated local cost of $178,630 is pledged by the several sponsors, including the City Council of Corning, to become available when needed. The definite arrangements are to be developed in one or several of many possible ways. Some of these may involve authorizing State legislation.

Watershed loans, as authorized in the Watershed Protection Act, may be secured by one or more of the sponsors if State legislation is enacted to provide such borrowing authority.

This work plan does not constitute a financial document to serve as a basis for the obligation of Federal funds. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the appropriation of funds for this purpose.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment Measures

Land treatment measures will be maintained by the individual landowners and/or operators as prescribed in the conservation farm plan developed between the farmers and the District. Technical assistance will be made available through the District by the Service.

Technical assistance for operating and maintaining the forestry measures included in Table 1 will be provided by the Section of Forestry, Iowa Conservation Commission, in cooperation with the U. S. Forest Service under the going Cooperative Forest Management Program.

Structural Measures

Structural measures included in this project are planned and designed to serve project objectives. The total benefits

to be derived from the installation of structural measures cannot usually be realized unless the measures are operated and maintained in such a manner that they will serve the purpose for which they were installed. An active program for operation and maintenance is essential and consists of:

1. An agreed-to plan which provides adequate and sound arrangements for proper operation, timely inspection, and prompt and appropriate performance of needed maintenance, financing the costs of operation and maintenance, and the maintaining of records reflecting the actions required and taken.

2. The carrying out of the provisions of the agreed-to plan in a manner consistent with the spirit, intent, and purpose of the plan and project.

The responsibility for operation and maintenance of the structural measures, except structure M-1-A, will be assumed by the District and the County. An agreement will be executed between these parties, whereby, in accordance with Iowa law, the County will levy taxes as needed upon the agricultural lands in the county, not to exceed one-quarter mill per year, the proceeds of which will be used for operation, repair, alteration, and maintenance of the structural measures. The revenue from this tax is estimated to be adequate for the necessary maintenance.

Structure M-1-A will be maintained jointly by the District, the County, the Water Board, and the Conservation Board. This consists of the dam, principal and emergency spillways, the drawdown pipe and gate, and the water storage reservoir.

The recreational area and basic facilities will be maintained by the Conservation Board for public access and use for the useful life of the project.

Inspections of individual structural measures will be made annually by the local sponsoring organizations and the Service between May 1 and June 30 of each year, and following extremely heavy rains or other unusual conditions that may affect the maintenance requirements of the structural measures.

The Service will participate in operation and maintenance only to the extent of (1) furnishing technical assistance to aid in inspection and (2) furnishing technical design information necessary for operation and maintenance. When operation and maintenance is not being properly carried out,

as found from inspections by the Soil Conservation Service, the matter will be brought to the attention of the sponsoring local organizations.

An "Operation and Maintenance Agreement(s)" setting forth all details in connection with responsibilities for operation and maintenance of the structural measures will be executed prior to the signing of project agreements for construction of the structural measures. This agreement will be executed by the Service, the District, and the County for all structures except structure M-1-A.

An "Operation and Maintenance Agreement(s)" setting forth all details in connection with responsibilities for operation and maintenance of structure M-1-A and of the recreational facilities will be executed prior to the signing of the project agreement(s). The operation and maintenance agreement for structure M-1-A will be executed by the Service, the District, the Conservation Board, the Water Board, and the County. The operation and maintenance agreement for the recreational facilities will be executed by the Service and the Conservation Board.

The estimated average annual operation and maintenance costs of the structural measures, except M-1-A, are $1,210. The maintenance cost of structure M-1-A is $500 and the cost of operation and maintenance of the recreational facilities is $12,470. The total annual operation and maintenance costs are $14,180 (Table 4).

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Walter's Creek Watershed, Iowa

Installation Cost Item	Acres to be Treated	Estimated Cost (Dollars) 1/ P.L. 566	Other	Total
LAND TREATMENT MEASURES				
Soil Conservation Service				
Cropland	7,860	-	212,000	212,000
Pasture	1,500	-	65,400	65,400
Technical Assistance		30,000	26,400	56,400
SCS Subtotal		30,000	303,800	333,800
Forest Service				
Woodland	277	-	2,580	2,580
Technical Assistance		-	800	800
FS Subtotal		-	3,380	3,380
TOTAL LAND TREATMENT		30,000	307,180	337,180

Installation Cost Item	Unit	Number	Estimated Cost (Dollars) 1/ P.L.566	Other	Total
STRUCTURAL MEASURES					
Soil Conservation Service					
Grade Stabilization	No.	37	404,860	-	404,860
Floodwater Retarding	No.	2	39,200	-	39,200
Multi-Purpose Str.M-1-A	No.	1	168,500	43,180	211,680
Drawdown Pipe & Gate	No.	1	5,600	5,600	11,200
Basic Recreation Fac.	No.	1	95,900	95,900	191,800
Subtotal - Construction			714,060	144,680	858,740
INSTALLATION SERVICES					
Soil Conservation Service					
Engineering Services			144,940	15,830	160,770
Other			59,980	9,510	69,490
Subtotal - Installation Services			204,920	25,340	230,260
OTHER COSTS					
Land, Easements & R/W			116,250	141,140	257,390
Road Alterations			9,690	10,310	20,000
Surveys, Legal Fees, etc.			-	4,800	4,800
Administration of Contracts			-	8,080	8,080
Subtotal - Other Costs			125,940	164,330	290,270
TOTAL STRUCTURAL MEASURES			1,044,920	334,350	1,379,270
T O T A L P R O J E C T			1,074,920	641,530	1,716,450
SUMMARY					
Subtotal SCS			1,074,920	638,150	1,713,070
Subtotal FS			-	3,380	3,380
T O T A L P R O J E C T			1,074,920	641,530	1,716,450

1/ Price Base - 1963

Date: July 1964

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
(at time of Work Plan Preparation)

Walter's Creek Watershed, Iowa

Measures	Unit	Applied to Date	Total Cost (Dollars) 1/
LAND TREATMENT			
Terraces	Mile	182	61,900
Contour Farming	Acre	11,960	-
Grassed Waterway	Acre	357	123,200
Stabilization Structure	No.	9	15,300
Farm Pond	No.	43	41,900
Diversion	Mile	5	4,300
Pasture Renovation	Acre	250	8,700
Tile Drains	Mile	20	30,000
TOTAL	xxx	xxx	285,300

1/ Price Base - 1963

Date: July 1964

TABLE 2 - ESTIMATED

Walter's

Structure Site Number	Installation Cost - P.L. 566 Funds					
	Construction	Instal. Services		Land, Ease. & ROW		Total P.L. 566
		Eng.	Other	Land	Other	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1-1	3,140	630	250			4,020
4-2	11,540	2,310	940			14,790
5-1	9,130	1,830	740			11,700
5-2	16,240	3,250	1,320			20,810
12-1	16,240	3,250	1,320			20,810
12-2	14,900	2,980	1,210			19,090
13-1	9,970	1,990	810			12,770
14-1	12,430	2,490	1,010			15,930
15-1	10,640	2,130	860			13,630
D-15-2	21,280	4,260	1,730			27,270
15-3	13,220	2,640	1,070			16,930
16-1	12,020	2,400	980			15,400
18-1	3,140	630	250			4,020
18-2	11,650	2,330	950			14,930
22-1	16,240	3,250	1,320			20,810
23-1	10,190	2,040	830			13,060
D-23-2	17,920	3,580	1,460			22,960
23-3	9,690	1,940	790			12,420
24-1	17,580	3,520	1,430			22,530
24-2	11,980	2,400	970			15,350
24-3	10,980	2,190	890			14,060
24-4	12,990	2,600	1,060			16,650
25-1	15,960	3,190	1,300			20,450
26-1	11,980	2,400	970			15,350
27-1	2,130	430	170			2,730
29-1	12,210	2,440	990			15,640
29-3	11,420	2,280	930			14,630
31-1	8,510	1,700	690			10,900
31-2	12,210	2,440	990			15,640
32-1	13,660	2,730	1,110			17,500

STRUCTURE COST DISTRIBUTION 33B

Creek Watershed, Iowa

(Dollars) 1/

Installation Cost - Other Funds							
	Instal. Services		Other				
Construction	Eng.	Other	Adm. Contracts	Land, Ease. & ROW Land	Land, Ease. & ROW Other	Total Other	Total Instal. Cost
(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
			30	400		430	4,450
			100	400		500	15,290
			80	480		560	12,260
			140	500		640	21,450
			140	520		660	21,470
			130	400		530	19,620
			90	270		360	13,130
			110	360		470	16,400
			90	400		490	14,120
			190	1,110		1,300	28,570
			120	430		550	17,480
			110	360		470	15,870
			30	50		80	4,100
			100	30		130	15,060
			140	790		930	21,740
			90	420		510	13,570
			160	910		1,070	24,030
			90	300		390	12,810
			160	1,490		1,650	24,180
			110	510		620	15,970
			100	300		400	14,460
			120	360		480	17,130
			140	780		920	21,370
			110	390		500	15,850
			20	50		70	2,800
			110	510		620	16,260
			100	410		510	15,140
			80	300		380	11,280
			110	450		560	16,200
			120	590		710	18,210

TABLE 2 - ESTIMATED

Walter's

Structure Site Number	Installation Cost - P.L. 566 Funds					
	Construction	Instal. Services		Land, Ease. & ROW		Total P.L.566
		Eng.	Other	Land	Other	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
33-1	11,310	2,260	920			14,490
33-2	11,310	2,260	920			14,490
33-3	9,970	1,990	810			12,770
34-1	8,740	1,750	710			11,200
34-2	1,900	380	150			2,430
33-1	8,400	1,680	680			10,760
39-1	9,180	1,840	750			11,770
40-1	11,200	2,240	910			14,350
43-1	10,860	2,170	880			13,910
Sub-total	444,060	88,820	36,070			568,950
M-1-A Struc.	168,500	39,500	16,040	70,575	9,690 2/	304,305
Drawdown Pipe and Gate	5,600	2,240	910			8,750
Basic Recreation Facilities	95,900	14,380	6,960	45,675		162,915
Subtotal	270,000	56,120	23,910	116,250	9,690	475,970
GRAND TOTAL	714,060	144,940	59,980	116,250	9,690	1,044,920

1/ Price base - 1963
2/ Cost of raising county road bridge
3/ Legal fees, land surveys, etc.

STRUCTURE COST DISTRIBUTION (cont'd)

Creek Watershed, Iowa

(Dollars) 1/

Installation Cost - Other Funds							Total Instal. Cost (15)
	Instal. Services		Other				
Construction (8)	Eng. (9)	Other (10)	Adm. Contracts (11)	Land, Ease. & ROW Land (12)	Other (13)	Total Other (14)	
			100	500		600	15,090
			100	410		510	15,000
			90	360		450	13,220
			80	460		540	11,740
			20	50		70	2,500
			80	30		110	10,870
			80	510		590	12,360
			100	440		540	14,890
			100	360		460	14,370
			3,970	17,390		21,360	590,310
43,180	2,840	1,160	1,890	78,075	10,310 2/	137,455	441,760
5,600			100			5,700	14,450
95,900	12,990	8,350	2,120	45,675	4,800 3/	169,835	332,750
144,680	15,830	9,510	4,110	123,750	15,110	312,990	788,960
144,680	15,830	9,510	8,080	141,140	15,110	334,350	1,379,270

Date: July 1964

TABLE 2A - ALLOCATION OF INSTALLATION COSTS OF STRUCTURAL MEASURES

Walter's Creek Watershed, Iowa

(Dollars) 1/

Item	Purpose			Total
	Flood Prevention	Municipal Water Supply	Recreation	
(1)	(2)	(3)	(4)	(5)
STEP A				
Single Purpose				
Floodwater Retarding and Grade Stabilization Structures	590,310	0	0	590,310
Multiple Purpose				
M-1-A Flood Prevention and Non-Agric. Water Mgmt.	179,970	26,580	582,410	788,960
Total	770,280	26,580	582,410	1,379,270
STEP B				
P. L. 566	747,680	0	297,240	1,044,920
Other	22,600	26,580	285,170	334,350
Total	770,280	26,580	582,410	1,379,270

1/ Price base - 1963

Date: July 1964

TABLE 2B - BASIC RECREATION FACILITIES STRUCTURE M-1-A

Walter's Creek Watershed, Iowa

(Dollars) 1/

Basic Facility	Total
1. Interior Roads (2 lane) 1.1 miles	17,500
2. Interior Roads (1 lane) 1.6 miles	12,500
3. Access Roads 3.2 mile	52,500
4. Parking Areas 200 spaces	9,000
5. Site Preparation	8,000
6. Riding Trail 2.75 miles	3,300
7. Foot Trails 4.0 miles	4,800
8. Boat Ramps and Docks (2)	5,000
9. Beach Sanding and Grading (200 feet)	5,000
10. Bathhouse (1)	10,000
11. Well - Beach and Admin. Areas (1)	4,000
12. Septic Tank and Field	2,500
13. Picnic Tables	
Area No. 1 - 50 each	1,500
Area No. 2 - 40 each	1,200
Areas Nos. 3 to 6 - 60 each	1,800
14. Grills 75 (1 per 2 tables)	1,500
15. Toilets	
Area No. 1 - 1 pair (6 unit)	4,500
Area No. 2 - 1 pair (4 unit)	3,000
Areas Nos. 3-6 - 4 pair (2 unit)	4,000
16. Well, with pump - Area 2	1,700
17. Fence, Mixed Types, 2,000 rods	9,000
18. Signs, Mixed Types	1,000
19. Camp Unit 50 each	10,000
20. Utility Bldg. w/showers, toilets, etc.	10,000
21. Toilet, Frame (2 unit) 1 pair	1,000
22. Well, w/pump, etc., Camp Area	5,000
23. Septic Tank and Field, Camp Area	2,500
Total	191,800

1/ Price Base - 1963

Date: July 1964

TABLE 3 - STRUCTURE DATA

FLOODWATER RETARDING STRUCTURES AND WATER SUPPLY RESERVOIRS

Walter's Creek Watershed, Iowa

Item	Unit	STRUCTURE NUMBER			Total
		D-15-2	D-23-2	M-1-A	
Drainage Area					
Total	sq mi	1.49	1.20	28.0	30.69
Uncontrolled	sq mi	1.17	0.91	23.0	25.08
Storage Capacity					
Sediment	ac ft	130.0*	105.0*	4450**	4685
Floodwater	ac ft	150.0	115.0	5000	5265
Water supply	ac ft	-	-	960	960
Recreation	ac ft	-	-	3920	3920
Total	ac ft	280.0	220.0	14330	14830
Surface Area					
Sediment pool	ac	15.0	14.4	401	430.4
Recreation pool	ac	-	-	650	650.0
Water supply pool	ac	-	-	700	700.0
Floodwater pool	ac	31.4	25.6	962	1019.0
Volume of Fill	cu yd	28,700	20,200	225,000	273,900
Elevation Top of Dam	ft	1163.5	1162.5	1180.0	xx
Maximum Height of Dam	ft	33.6	27.5	55.0	xx
Emergency Spillway					
Crest elevation	ft	1161.0	1160.5	1175.8	xx
Bottom width	ft	150	100	300	xx
Type		Veg.	Veg.	Veg.	xx
Percent chance of use		2	2	2	xx
Ave.Curve No.-Cond.II		77	77	77	xx
Emergency spillway hydrograph					
Storm rainfall(6hr)	in	5.3	5.3	7.76	xx
Storm runoff	in	2.9	2.9	3.8 2/	xx
Velocity of flow (v_c) 1/	ft/sec	2	2	-	xx
Discharge rate 1/	c.f.s.	115	75	-	xx
Max. w.s. elev 1/	ft	1161.6	1162.2	1175.8	xx
Freeboard hydrograph					
Storm rainfall (6 hr.)	in	7.76	7.76	13.5	xx
Storm runoff	in	5.1	5.1	8.2	xx
Discharge rate 1/	c.f.s.	1000	680	5020	xx
Max. w.s. elev. 1/	ft	1163.5	1162.5	1180.0	xx
Prin.Splwy.-Crest elev.	ft	1153.5	1154.0	1169.0	xx
Storm Duration	hr.	10	10	42	xx
Storm rainfall	in	5.3	5.31	7.26	xx
Storm runoff	in	2.9	2.87	4.59	xx
Capacity	c.f.s.	110	106	980	xx
Capacity Equivalents					
Sediment volume	in	2.1	2.1	3.0	xx
Detention volume	in	2.4	2.4	3.3	xx
Spillway storage	in	1.35	1.1	2.9	xx
Class of Structure		a	a	b	xx

1/ Maximum during passage of hydrograph

2/ Less than "principal" runoff.

Date: July 1964

* Designed for 50-year sediment storage capacity.

**Designed for 100-year sediment storage capacity.

TABLE 3A - STRUCTURE DATA

GRADE STABILIZATION STRUCTURES

Walter's Creek Watershed, Iowa

Site No.	Drainage Area (Acres) Uncontrolled	Drainage Area (Acres) Controlled	Drainage Area (Acres) Total	Drop (Feet)	Earth Fill 1/ (Cu Yd)	Concrete 1/ (Cu Yd)	Type Structure
1-1	184	116	300	4		11	D.I. 2/
4-2	190	-	190	20			D.I.
5-1	240	-	240	17			D.I.
5-2	255	240	495	25			D.I.
12-1	280	-	280	30			D.I
12-2	177	-	177	30			D.I.
13-1	70	-	70	30			D.I.
14-1	140	-	140	25			D.I.
15-1	175	-	175	18			D.I.
15-3	204	-	204	26			D.I.
16-1	154	-	154	24			D.I.
18-1	260	-	260	11		20	I.on C 3/
18-2	475	-	475	8		95	D.S. 4/
22-1	480	-	480	22			D.I.
23-1	190	-	190	15			D.I.
23-3	92	-	92	24			D.I.
24-1	470	-	470	24			D.I.
24-2	220	-	220	20			D.I.
24-3	103	-	103	25			D.I.
24-4	155	-	155	26			D.I.
25-1	470	-	470	22			D.I.
26-1	230	-	230	20			D.I.
27-1	265	-	265	9		14	I. on C.
29-1	245	-	245	20			D.I.
29-3	195	-	195	20			D.I.
31-1	85	-	85	18			D.I.
31-2	215	-	215	22			D.I.
32-1	390	-	390	8		75	D.S.
33-1	265	-	265	19			D.I.
33-2	190	-	190	20			D.I.
33-3	145	-	145	18			D.I.
34-1	230	-	230	6		56	D.S.
34-2	145	-	145	5		13	I. on C.
38-1	110	-	110	8		46	D.S
39-1	106	-	106	18			D.I.
40-1	206	-	206	18			D.I.
43-1	155	-	155	20			D.I.

1/ Earth and concrete quantities not computed except as shown.
2/ Drop Inlet
3/ Inlet on Culvert
4/ Drop Spillway

Date: July 1964

TABLE 4 - ANNUAL COSTS

Walter's Creek Watershed, Iowa

(Dollars) 1/

Evaluation Unit (1)	Amortization of Installation Cost (2)	Operation and Maintenance (3)	Other Economic Cost (4)	Total (5)
I. M-1-A, D-15-2 D-23-2	38,220	13,080	11,800	63,100
II. All remaining structural measures	20,920	1,100	820	22,840
TOTAL	59,140	14,180	12,620	85,940

1/ Price base: Installation costs are based on 1963 price level and are amortized at 3.0 percent over 50 years. Operation and maintenance costs are based on projected long-term prices.

Date: July 1964

TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Walter's Creek Watershed, Iowa

(Dollars) 1/

Item (1)	Estimated Average Annual Damage: Without Project (2)	Estimated Average Annual Damage: With Project (3)	Damage Reduction Benefit (4)
Floodwater			
Crop and Pasture	1,960	310	1,650
Erosion			
Gully			
Land	34,060	-	34,060
Indirect	3,450	30	3,420
TOTAL	39,470	340	39,130

1/ Price Base: Projected long-term prices.

Date: July 1964

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Walter's Creek Watershed, Iowa

(Dollars) 1/

Evaluation Unit (1)	AVERAGE ANNUAL BENEFITS: Flood Prevention: Damage Reduction (2)	Flood Prevention: More Intensive Land Use (3)	Flood Prevention: Changed Land Use (4)	Secondary (5)	Other (6)	Total (7)	Avg. Annual Cost (8)	Benefit Cost Ratio (9)
I. D-15-2 D-23-2 M-1-A	7,290	3,260	5,430	15,930	143,310 3/	175,220	63,100	2.78:1.0
II. All remaining structural measures	30,390	-	-	3,120	60 4/	33,570	22,840	1.46:1.0
TOTAL	37,680 2/	3,260	5,430	19,050	143,370	208,790	85,940	2.43:1.0

1/ Price Base: Projected long-term price level for benefits; 1963 price level for costs.
2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $1,450 annually.
3/ Includes $135,000 recreation benefits and $8,310 municipal water benefits.
4/ Reduced future bridge costs.

Date. July 1964

TABLE 7 - BENEFITS AND COSTS BY CONSTRUCTION UNITS

Walter's Creek Watershed, Iowa

(Dollars) 1/

Construction Unit	Structures	Annual Benefits	Annual Costs
1	1-1	420	190
2	4-2	1,180	620
3	5-1, 5-2	1,790	1,430
4	12-1	1,370	940
5	12-2	1,180	840
6	13-1	850	540
7	14-1	780	720
8	15-1, 15-3	1,470	1,330
9 2/	D-15-2 (15-1, 15-3)	3,720	2,690
10	16-1	750	670
11	18-1	950	180
12	18-2	1,170	610
13	22-1	1,540	940
14	23-1, 23-3	1,180	1,080
15 2/	D-23-2 (23-1, 23-3)	3,710	2,230
16	24-1, 24-2	2,320	1,740
17	24-3	770	600
18	24-4	920	730
19	25-1	1,330	940
20	26-1	840	650
21	27-1	970	120
22	29-1	1,200	680
23	29-3	770	660
24	31-1	510	480
25	31-2	970	710
26	32-1	1,290	640
27	33-1	860	670
28	33-2	1,220	630
29	33-3	920	560
30	34-1	780	490
31	34-2	500	200
32	38-1	490	460
33	39-1	530	520
34	40-1	1,100	640
35	43-1	650	630
36	M-1-A	170,440	60,590

1/ Price Base - 1963 price level for installation costs; projected long-term price level for maintenance costs and benefits.

2/ Dependent construction units. Depend upon easements being assured for structures shown in parentheses. Benefits and costs are for combination of structures.

Date: July 1964

INVESTIGATIONS AND ANALYSES

Land Use and Treatment Studies

An inventory of present land use was developed for the entire watershed area. This inventory included the present major classification of use such as cropland, pasture, woodland, etc. The land treatment measures that have been installed on cropland areas were itemized for each land capability class. This inventory was developed, from information of record, by Service technicians.

A total conservation needs study was then made of the watershed area to show all of the land treatment measures that would be required to reduce soil loss from sheet erosion to tolerable amounts according to technical guides for the District.

The amount of soil lost from sheet erosion under present conditions and with the planned land treatment measures installed was studied and computed for use in formulating an adequate land treatment program for watershed protection.

In consideration of the above information, Service technicians, with assistance of the District Commissioners, developed a table of land use changes and land treatment measures that would be installed during the project installation period. The information was tabulated by various capability classes and indicated the land use, by mechanical practices, and the crop rotations that would be installed on these cropland areas. The land treatment measures to be applied during theproject installation period represent the expected accomplishments of the sponsors and farmers.

Erosion Investigations

A field reconnaissance was made to study the type and general extent of the erosion problems that are causing damage to lands and improvements in the watershed.

It was determined that sheet erosion is severe on the cropland areas that are still in need of land treatment. Gully erosion is severe and is causing voiding of crop and pasture and depreciation of adjacent and intervening areas.

Gully Erosion: Studies were made of the gully systems above all of the proposed structures to determine the rate of

land voiding by gully erosion and the rate of land depreciation which accompanies the expansion of a gully system. Depreciation is considered as a damage which occurs when land reverts to a less intensive use due to the inaccessibility of areas for normal farm operations and the dissection of fields into small unfarmable units.

A set of 1938 aerial photos of the areas were studied stereoscopically and the extent of the gully erosion at that time was plotted on overlays and measured. With the aid of a set of 1960 photos the extent of the present gully erosion was field checked and recorded. These data were tabulated and computed to determine the present extent of voiding. The annual rate of voiding was obtained by dividing the difference between the voided areas as determined above by the number of intervening years.

Based on field observations, these rates of growth were adjusted to provide estimates of future rates taking into consideration the extent of land treatment measures that have been installed recently and those planned to be installed; the topography and gully gradients that would be encountered in any future gully advance; the change of soil types; the change in depth of gullies; the rainfall of the area; and the drainage areas remaining and susceptible to damage. On this basis, an annual rate of gully development was established for the future 50-year period.

Based upon that expected extension and widening of the gully system, areas were delineated on the overlays to show those areas that would depreciate to a less intensive land use in the future 50-year period and the annual rate calculated.

Sheet Erosion: Detailed studies were made of the upland agricultural areas to determine the rates of sheet erosion both without and with the installation of proposed land treatment measures.

The Musgrave formula, as modified for use in the Cornbelt Area, for predicting soil loss in Iowa was used to compute soil losses by sheet erosion on the basis of cover, slope length, percent of slope, soil characteristics, rainfall, and management practices. The data needed for these computations were obtained from the local SCS work unit conservationist, area staff and soil scientist, state technical staff, farm plans, a field inspection, and a study of soil conservation surveys. The volume of sheet erosion under existing conditions and the volume with the project installed was thus developed for the several parts of the watershed.

An estimate of the sheet erosion delivery ratio to various sites was based upon general information that has been secured in past studies. It was estimated that 50 percent of the gross sheet erosion is transported downstream as sediment. These losses occur in transit by being deposited on the colluvial and alluvial slopes, in the valleys, in road ditches and outlet channels, along fence lines, and in or adjacent to waterways. Erosion estimates and estimates of the sediment conveyed to all structure sites in the watershed were recorded on Form SCS-309. Information from this form was used by the engineer in providing for sediment storage needs required in the design of structures.

Other Damage

Preliminary investigations revealed that sedimentation, swamping, and infertile overwash were negligible.

Geologic Investigation

A field reconnaissance was made of the watershed to observe the geological, physiographical, and other features of the watershed which might influence the selection of satisfactory sites and the design of structural measures. Construction experience in other watersheds with similar characteristics was useful as a guide in appraising the geological feasibility of structure sites that were selected.

All proposed structure sites were observed by the geologist and by the design engineers.

Based upon these observations, and previous experience at similar sites, it appears that the structures are physically feasible to install and that adequate borrow materials are available. Soil borings were made at structure site M-1-A with an SCS operated soil boring rig. A log of borings was made and samples of materials were analyzed by the SCS Soils Mechanics Laboratory. Further site investigations will be made at all structure sites where major stabilization structures are planned. The extent and complexity of these investigations will vary from site to site and will be governed by variations in materials encountered. Sufficient funds have been included in the estimate of engineering design for this purpose.

Hydraulic and Hydrologic Investigations

The first step in the hydrologic investigation was a regional frequency study of stream gage information. From these data a relationship between the drainage area size and the mean

annual discharge was developed. The drainage area size was also related to the standard deviation so that the data from the larger drainage areas that are gaged could be extended to areas the size of Walter's Creek and smaller. These data were used as a check on the peak flows developed by synthetic methods for flooding frequency evaluations and design of structural measures.

In the preliminary planning stage the floodplain was delineated in the field and preliminary routings made. From these data it became apparent that the floodwater damage reduction benefits would be only a small part of the project justification and therefore no more detailed routings were made.

The hydraulic characteristics of the valley downstream of site M-1-A were determined by seven ranges. These ranges were located so as to, as accurately as possible, describe in general the stream channel and the floodplain.

The flooding frequencies by reaches as determined by preliminary routings were field checked by interviews to determine whether or not the estimates were valid. The interview data supported the validity of the preliminary routings.

The main channel of Walter's Creek is different from the average in that its size increases in the downstream direction even faster than the discharge. North of Corning it appears that the channel capacity is sufficient to handle about an annual flood under present conditions while at the outlet the existing capacity is such that a 40 to 50 year frequency flood would probably not overtop the banks.

In the development of the synthetic hydrograph for the design of structural measures, Weather Bureau Rainfall Atlas, Technical Paper No. 40, was used to determine the amount and frequency of rainfall for storms of different durations that are anticipated in this general area. It is necessary to use rainfall data for estimating runoff amounts because no stream gaging stations are located in the watershed. Runoff curve numbers were computed for the watershed area. These numbers are an index of the runoff producing potential of a particular area. The local soil types, vegetative cover, and land treatment measures that are installed and that will be installed within the project installation period were considered in the computation of the runoff curve number, both for the present and the anticipated future watershed conditions.

The rainfall and associated computed runoff volumes were used in the hydrologic design of the detention type structures

to be installed. Release rates of the structures were compared with the inflow from their contributing drainage areas and SCS TR-10 checks were made for all detention type structures to determine that adequate storage would be provided for all 50-year frequency floods regardless of duration. The full or direct flow type structures were designed using runoff amounts computed for a 6-hour rainfall, and with the associated peak rates of runoff as determined by the use of Iowa Technical Note No. 10.

Economic Investigations

Floodwater Damage: Floodwater damage studies were confined to Walter's Creek bottomlands. Land use was determined for the flooded area as was the cropping pattern within the cropland areas. The monthly damage values for each crop and pasture were determined by weighting the monthly damage values by the percentage distribution of damaging storms by months. This was done for each crop by two depth increments, 0-2 feet and over 2 feet.

A Flood Damage-Frequency curve was developed and the area under the curve measured and converted into total dollars by using the value per square inch according to the scale of the graph. This gave the average annual floodwater damage.

The above average annual damage determinations were based on hydrologic data considering the one largest flood in the growing season for each year. Economic studies and findings in other generally similar watersheds were used to determine an adjustment factor for this watershed for the most damaging flood each year. This factor was determined to be 15 percent.

Recurrent damage from duplicate flooding of bottomlands by more than one flood in a growing season were included by adding 15 percent of the average annual damage determined when considering only the one most damaging flood in the growing season for each year as covered above. The monetary value of average annual flood damage to crops and pasture without the project were determined in this manner.

A flood damage versus frequency relationship was developed and used to determine the average annual floodwater damage with project in the same manner as without project conditions.

The procedures and methodology involved in the floodwater damage studies are set forth in the SCS Economics Guide, Chapter 3, "Appraisal of Floodwater Damage". Crop yield data were based upon Special Report No. 25, "Estimated Crop Yields on Iowa Soils", developed jointly by Iowa State

University and the Service, and upon the experience of farmers in the watershed and Service technicians.

Gully Erosion Damage: The evaluation of gully erosion damage to land was based on the annual land losses from voiding and depreciation to less intensive use of the adjacent fields. These annual rates, for voiding and for depreciation, were multiplied by the per acre values to find total damages that occur at each site. These per acre values represent losses that will occur in years that follow, since the damage cannot be recovered.

The land use and crop rotations considered for these evaluations was that which is within the criteria and standards of the use capabilities of the land, determined through soil surveys and land use capability classifications. The level of yields used were those obtained by farmers following a moderately high level fertility and management program and an intensity of farming operations consistent with the most intensive practical cropping pattern applicable within the area. Where associated soil and water conservation measures were necessary to make possible the above level of intensity of farming, the average annual value of the costs of these required associated measures were deducted from the total average annual damage.

The gross income from the lands affected was determined on a per acre basis as the monetary values of all the products grown on the area, e.g., field crops and pasture, times their respective long-term price per unit. These values, when combined and weighted, gave the composite per acre gross income figure for the land that would be voided and that would be depreciated without the proposed project.

The gully damage evaluation takes account of: (1) Loss of income to farm operators during a 10-year adjustment period, (2) market value of the loss to landowners of a land resource, (3) value of the loss to local public interests of real estate tax base income, and (4) value of the loss to public interests not reflected in the market values of a land resource.

Damages without the project, with land treatment measures, and with the structural measures installed were computed.

All of the above procedures, and the methodology involved, are set forth in the SCS Economics Guide, Chapter 5, "Appraisal of Sediment and Erosion Damage". Crop yield data for soils of these areas were based upon Special Report No. 25, "Estimated Crop Yields on Iowa Soils", the experience

of farmers who have practiced conservation farming, and Service technicians.

Gully erosion damage to land occurring in other small areas of the watershed was studied; however, structural measures in those areas could not be economically justified and therefore were not included.

Benefits Due to Changed Land Use: From data supplied by the hydrologist as to the acres which will be less subject to flooding for various frequency floods, the agricultural economist determined: (1) The acres of land that will be converted to use as cropland from some lesser intensive use at present. Lands having floods no more often than once in five years were considered as adequate protection for normal cropland use. (2) Acres of present cropland that may have more intensive use. Land having floods more often than once in three years were considered for intensification of use.

Increases in the with-project over without project flood-water damages were subtracted from the expected increase in net income based on flood-free yields.

Associated costs required in making the changed land use possible were based on information from farmers and work unit technicians. These costs were deducted from gross changed land use benefits. Farmers have indicated that they fully intend to initiate these changes during the project installation period.

Net annual benefits from the changed land use of floodplain lands were determined by comparing net income without project with that after changed use was made with project, less the annual values of associated costs. Details of procedures followed are described in the SCS Economics Guide, Chapter 4, "Evaluation of Restoration of Former Productivity, Changed Land Use and More Intensive Use of Flood Plain Land".

Indirect Damages: Indirect damages were estimated to be 10 percent of the direct flood damages and were assumed to be reduced in the same proportion as the direct flood damages. Indirect damages consist of increased costs of normal farm operations, farm equipment breakage, rerouting of traffic, etc.

Recreation Benefits: Benefits from the recreational use of project works of improvement were used for project

justification. These benefits were achieved by incorporating recreation as a planned project objective of the project. Benefits were based on the value of a visitor-day use and the estimated number of days use annually.

The predicted number of visitor-days of annual use were determined by the Breau of Outdoor Recreation to be 90,000. They also indicated in their report that some 103,880 people reside in the six counties in the primary zone of influence and the two counties in the secondary zone.

Consideration was given to the effect that the following factors have on the prospective number of annual visitor-days use of the recreational site:

1. The area available in the project for recreational use (land and water).

2. Recreational facilities that will be available (docks, floats, picnicking areas, fireplaces, tables, bath houses, etc.).

3. Similar existing or proposed facilities within the immediate area that provide similar recreational opportunities.

4. Policing and maintenance of recreation areas.

5. Convenience in getting to the recreation areas.

The estimated annual visitor-days were multiplied by $1.50 per visitor-day to arrive at benefits. This value was based on a fully developed recreational facility.

Other Benefits: One existing bridge that is required for a road crossing will be replaced by the County at the end of its present life with a less costly culvert after the project is installed. Reduction of flow peaks resulting from the installation of a detention type structure will make such replacement possible and desirable. Savings in future bridge replacement costs have been calculated as a benefit resulting from the project.

Secondary benefits that will accrue within the immediate zone of influence of the project were considered in computing the benefits accruing to the project. Secondary benefits from a national viewpoint were considered to be minor and were not evaluated.

In computing secondary benefits resulting from the reduction of primary gully erosion damages, no secondary benefits were computed for the portion of those benefits which are the social-interest type benefits. The computed secondary benefits were considered to accrue from the reduction of a loss of income during a 10-year adjustment period and a loss to landowners.

General: Costs incurred for installation of land treatment measures, such as land treatment waterways and structures, were considered as associated costs. Associated costs are those costs incurred which are not connected directly with the installation of the structural measures, but are necessary to realize the benefits claimed for the structural measures.

To obtain the cost of the land, easements, and rights-of-way, the planning engineer determined the area of land to be occupied by each structure and the land use of this area. This consisted of the structure site, spillway area, and all lands needed for sediment and floodwater storage. Monetary values were then applied to these figures to determine, by land use, the estimated sale value of the land.

Other economic costs were considered in computing the average annual cost of the project. These other economic costs were considered to be any income loss that was in excess of the estimated value of the land and easements. These are shown in Table 4.

Current land market values agreed to by the Service and the sponsors are: Cropland $250 per acre; pasture $75 per acre; and idle areas (gullies and channels, etc.) $10 per acre. An average of $150 was used for structure M-1-A and the recreation area.

All monetary values have been converted to an average annual base. All costs, including associated costs, were amortized at 3.0 percent. All amortization was based on a 50-year project life.

Projected long-term prices were used for computing operation and maintenance costs and for all benefits. Current (1963) prices were used to estimate the costs of installing all structural and land treatment measures.

Primary benefits together with secondary benefits were used in computing the benefit-cost ratios of structural measures. Benefits from independent land treatment measures were not determined since past experience has shown that these measures produce combined public and private benefits in excess of their costs.

Engineering Design and Cost Estimates

The design of structural measures is based on applicable SCS criteria and design procedures. These include SCS Washington and State Engineering Handbooks, Engineering Memoranda SCS-27 and 43, Technical Release SCS-10, and other sources of recognized engineering material. A flood frequency of 50 years was used in the design of the principal spillways of all structures.

A stereoscopic study was made of aerial photographs to select potential sites for gully stabilization structures. An examination of each site was then made by the planning engineer and area engineer to develop definite structure proposals to stabilize the gullies. The structure locations were selected based upon the size of drainage area subject to damage, suitability of site, and location of overfalls. Instrument surveys were made at sites, where it was deemed necessary, to obtain profiles and other data for determining the proper structure inlet elevations for gully control. The state conservation engineer and work unit conservationist were consulted, and site visits made where necessary, to develop agreement and understanding regarding the structure or combinations of measures that would best meet the needs.

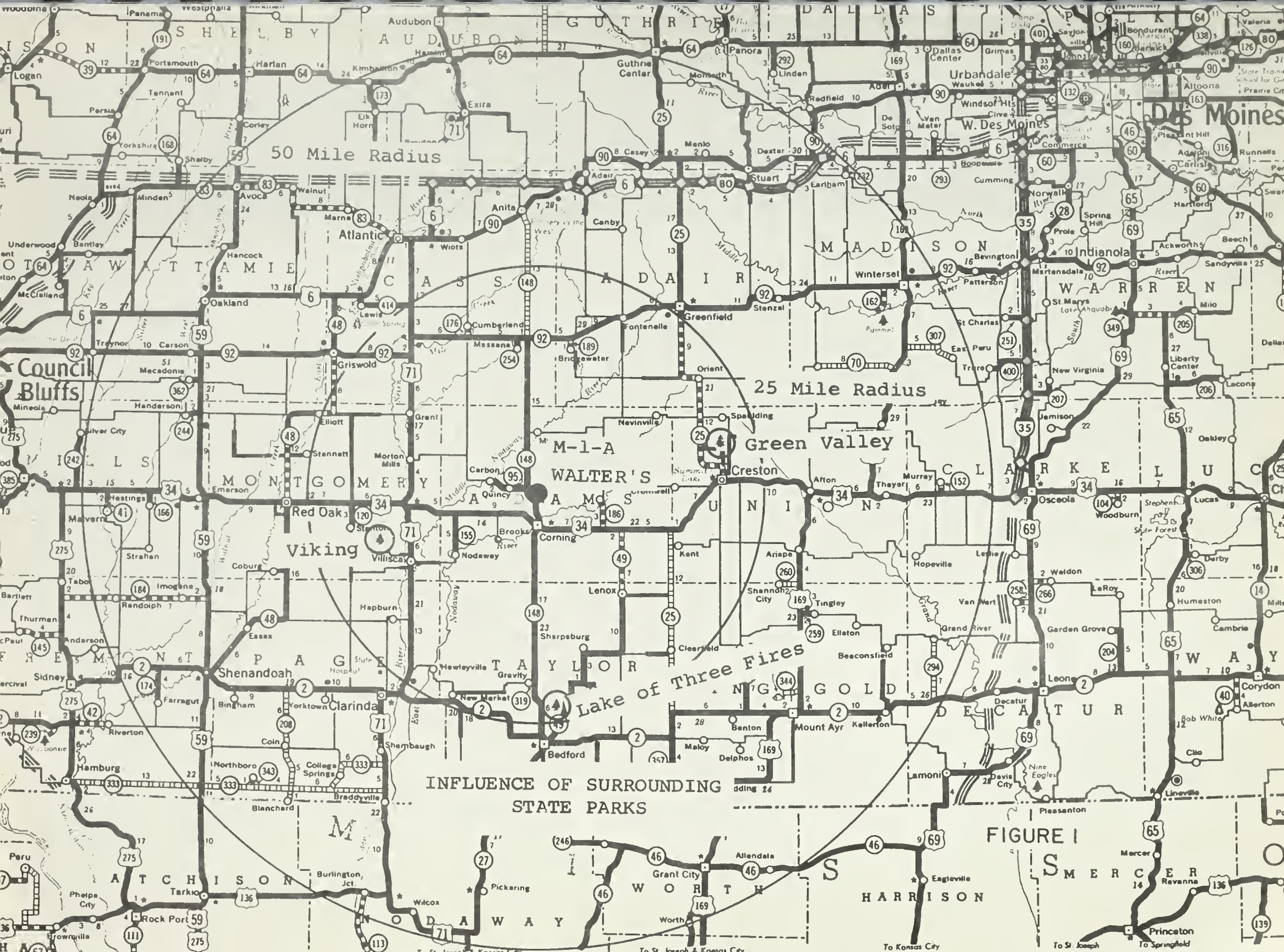
A chart was developed to estimate the total cost of drop inlet type grade stabilization structures. Data for this chart were collected from completed P.L. 566 watershed projects, pilot watershed projects, and the Little Sioux watershed project. Additional cost data were obtained from P.L. 46 structural projects which were adjusted to P.L. 566 specifications and contracting conditions. Unit prices were adjusted to reflect current bid and contract prices in other Iowa watersheds.

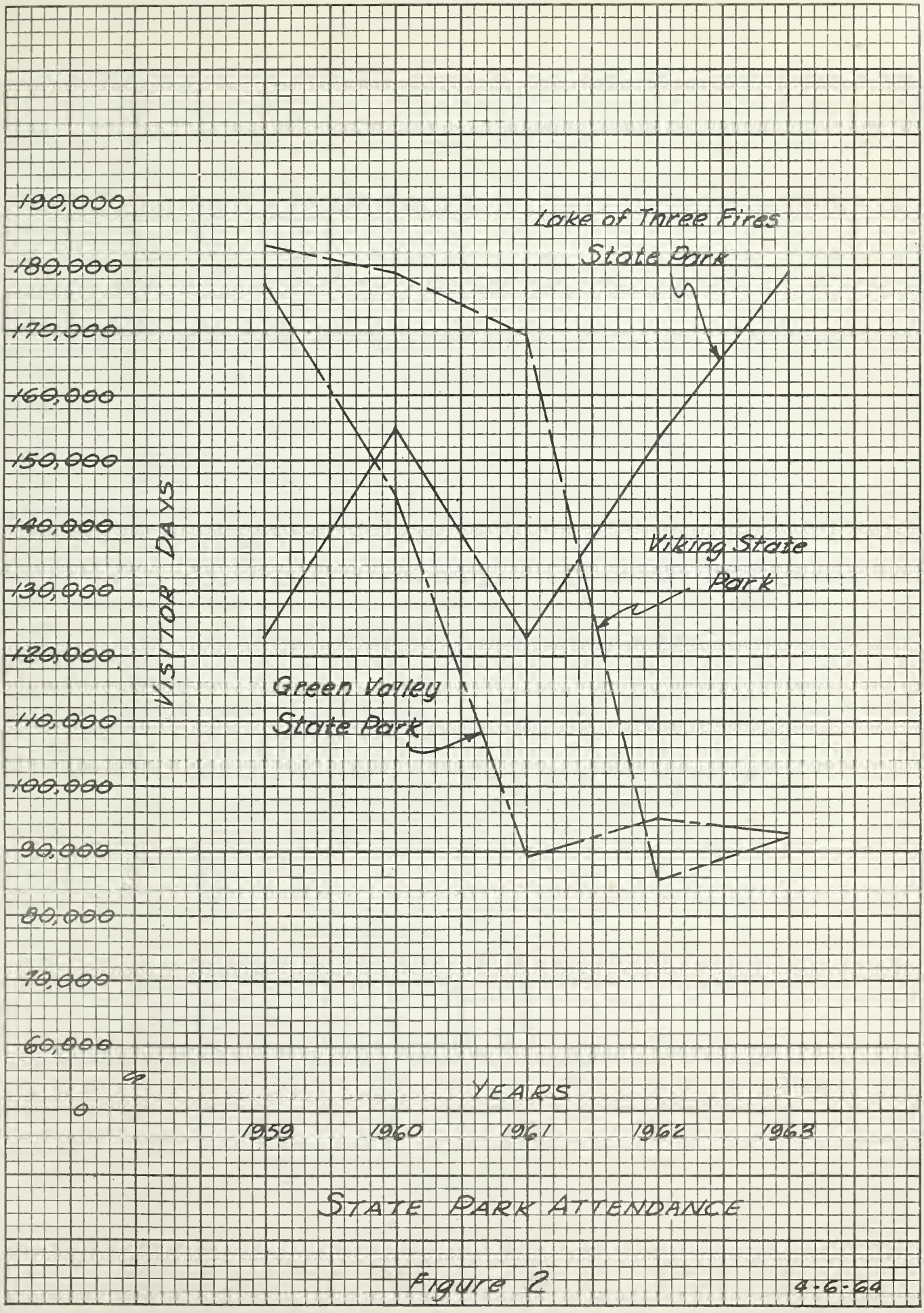
The average total cost of a proposed drop inlet structure was obtained directly from the chart for any given drainage area. This cost was then adjusted for greater or lesser head requirements, relative ease of obtaining sediment and water storage, excessive clearing at the site, and/or any unusual conditions that may cause the cost to deviate from the average. Cross-sections were taken at some of the proposed sites and where available, were used to determine the approximate earth fill quantities. The estimated costs of other construction features were added to provide a cost estimate for comparison to estimates obtained by use of the charts.

The drop inlet structures are primarily for the purpose of stabilizing waterways and gullies. They will all have

detention features that will result in downstream benefits. These benefits include reduced velocities, reduced depth of flow, reduced erosion, reduced sediment deposition and reduced size of structures downstream.

Four of the proposed structures are inlets on culverts and are primarily for the stabilization of the gullies above each, and three structures are concrete drop spillways. Cost estimates of these were based upon estimated quantities of the various items and materials to be used in their construction.

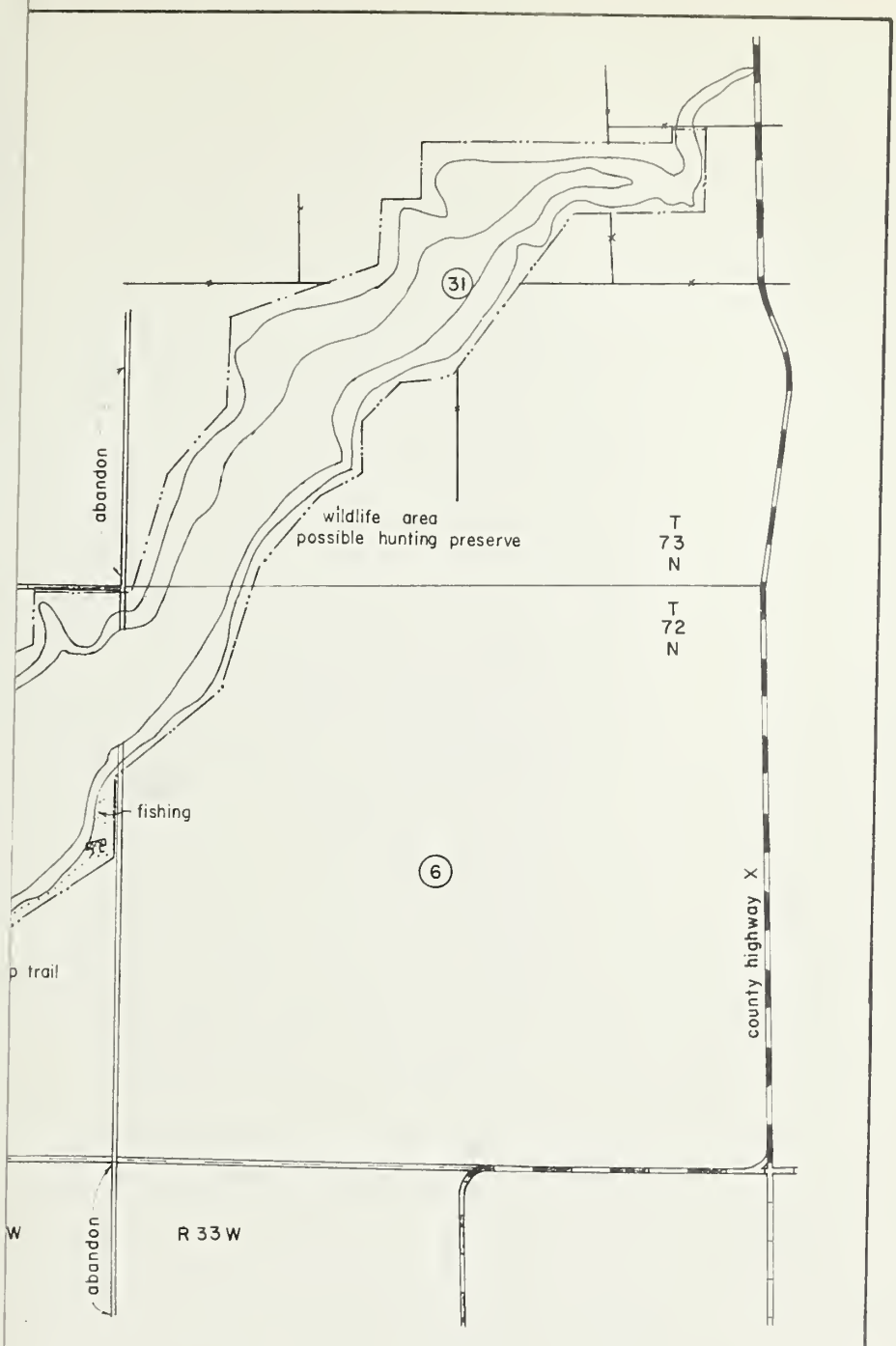

50 Mile Radius
25 Mile Radius
Green Valley
M-1-A
WALTER'S
Viking
Lake of Three Fires
INFLUENCE OF SURROUNDING
STATE PARKS
Des Moines
Council Bluffs
Creston
Red Oak
Shenandoah
Clarinda
Corning
Bedford
Osceola
Indianola
Atlantic
Winterset
Greenfield
Mount Ayr
Leon
Lamoni
Princeton
SHELBY
AUDUBON
GUTHRIE
DALLAS
POLK
POTTAWATTAMIE
CASS
ADAIR
MADISON
WARREN
MILLS
MONTGOMERY
ADAMS
UNION
CLARKE
LUCAS
FREMONT
PAGE
TAYLOR
RINGGOLD
DECATUR
WAYNE
ATCHISON
NODAWAY
WORTH
HARRISON
MERCER
To Kansas City
To St. Joseph
To Springfield
FIGURE I



STATE PARK ATTENDANCE

Figure 2

4-6-64



STRUCTURE M-1-A
RECREATION DEVELOPMENT
ALTER'S CREEK WATERSHED
ADAMS COUNTY, IOWA

Figure 3

4-17-64

N

abandon

wildlife area
possible hunting preserve

T 73 N

T 72 N

proposed taking line

share line of sediment, recreation, & water supply pool (700 acres)

flood pool emergency spillway contour (970 acres)

rough camp area
picnicking – reforestation

fishing

31

3

2

1

6

fishing & picnic area no. 6

foot & jeep trail

primitive camping

county highway X

improve road

state highway no. 148

boating

picnic

ramp

area no. 2

boating & water skiing

dock

picnic & playfield area no. 5

improve road

road relocation

group camp site public or private

R 34 W

abandon

R 33 W

fishing & picnic area no. 4

foot trail

fishing & picnics

ramp

beach (regrade)

proposed taking line

view

10

11

field games
picnics
area no. 1

fishing & picnic area no. 3

riding trail

improve road

stable site

foot trail

tent sites

cabin sites

camping

trailers

STRUCTURE M-1-A
RECREATION DEVELOPMENT
WALTER'S CREEK WATERSHED

ADAMS COUNTY, IOWA

660 330 0 660 1320 1980
Scale in feet

Figure 3

8-17-66

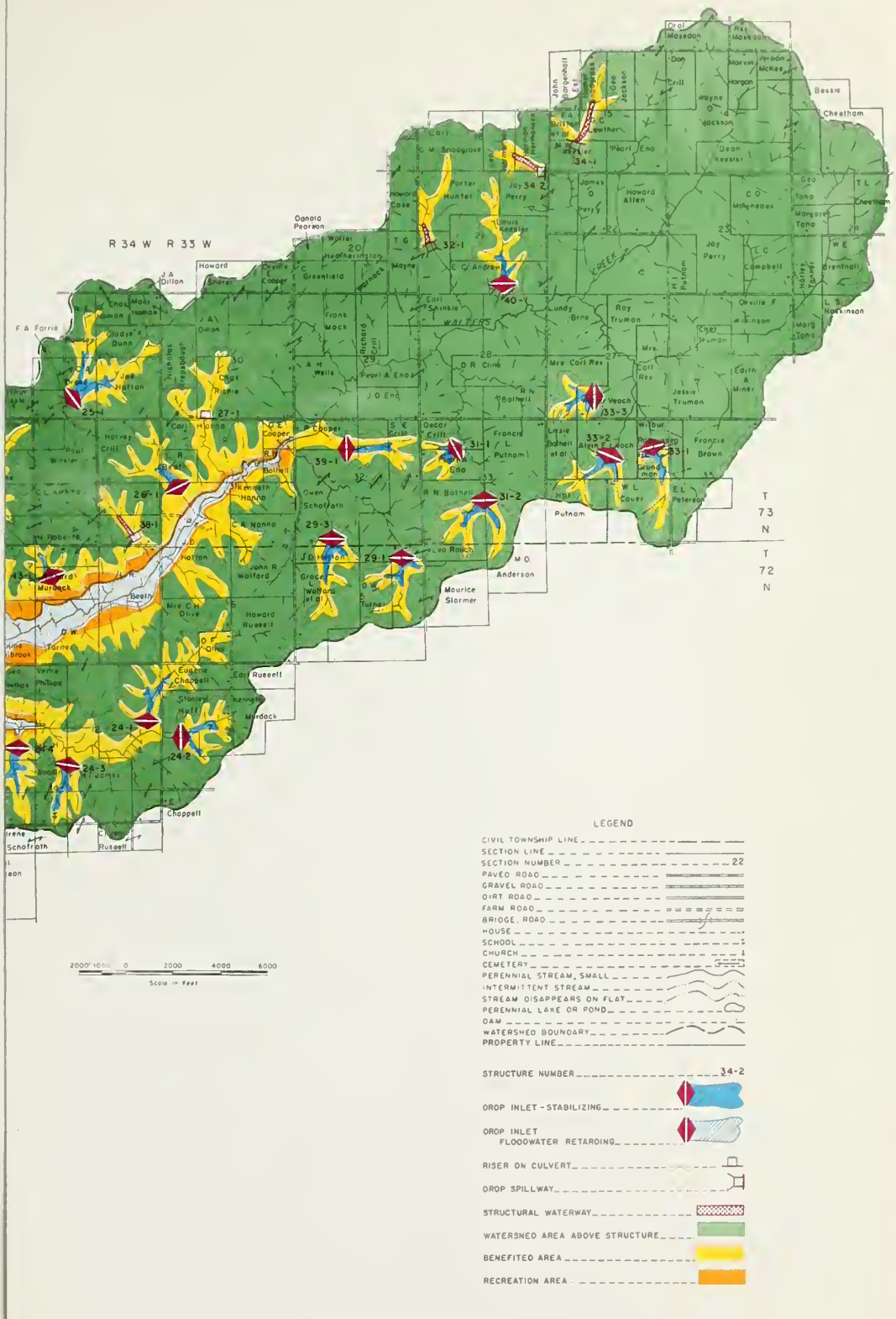


Figure 4

6-29-64

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

PROJECT MAP

WALTERS CREEK WATERSHED

ADAMS COUNTY, IOWA

Longitudes 94° 35' and 94° 50' W
Latitudes 41° 00' and 41° 10' N

R 34 W R 33 W

R 35 W R 34 W

T 73 N

T 72 N

T 71 N

LOCATION IN IOWA

CORNING

EAST NODAWAY RIVER

LEGEND

- CIVIL TOWNSHIP LINE
- SECTION LINE
- SECTION NUMBER
- PAVED ROAD
- GRAVEL ROAD
- DIRT ROAD
- FARM ROAD
- BRIDGE ROAD
- HOUSE
- SCHOOL
- CHURCH
- CEMETERY
- PERENNIAL STREAM, SMALL
- INTERMITTENT STREAM
- STREAM DISAPPEARS ON FLAT
- PERENNIAL LAKE OR POND
- DAM
- WATERSHED BOUNDARY
- PROPERTY LINE
- STRUCTURE NUMBER
- DROP INLET - STABILIZING
- DROP INLET - FLOODWATER RETARDING
- RISER ON CULVERT
- OPEN SPILLWAY
- STRUCTURAL WATERWAY
- WATERSHED AREA ABOVE STRUCTURE
- BENEFITED AREA
- RECREATION AREA

Figure 4

6-29-64